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**SITE HEALTH AND SAFETY PLAN  
FORMER RARITAN ARSENAL, EDISON, NEW JERSEY**

**PREPARED FOR  
U.S. ARMY CORPS OF ENGINEERS  
KANSAS CITY, MISSOURI**

**PREPARED BY  
DAMES & MOORE**

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 **DAMES & MOORE**

**D&M Job No. 19577-006-007  
October 1991**

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**DAMES & MOORE**  
**SITE SPECIFIC HEALTH AND SAFETY PLAN**

**PROJECT:** U.S. Army Corps of Engineers/Kansas City Missouri

**PROJECT NUMBER:** DACW41-89-D-0122  
D.O. 0006  
Dames & Moore Project No. 19577-006-007

**PROJECT SITE LOCATION:** Raritan Arsenal  
Edison, New Jersey

**PROJECT MANAGER:** William F. Klaassens

**SITE SAFETY OFFICER:** To be determined at a later date

**PLAN PREPARER:** Dennis Totzke  
ARITON

**PLAN REVIEWER:** Thomas M. Covilli, CIH

**PREPARATION DATE:** April, 1991 (Revised October, 1991)

Regional Health & Safety Manager

11/5/91 Thomas M. Covilli  
(Date)

Project Manager

11/6/91 William F. Klaassens  
(Date) JKS

## **I. PURPOSE**

The purpose of this Site Health and Safety Plan is to assign responsibilities, establish personnel protection standards, specify mandatory operating procedures, and provide for contingencies that may arise while field operations are being conducted at the site.

Occupational Safety and Health Administration (OSHA) standards 20 CFR 1910 and 1926 apply to work under this site-specific safety plan. Detailed OSHA requirements for hazardous waste operations are contained in 29 CFR 1910.120, "Hazardous Waste and Emergency Response; Interim Final Rule." Requirements of the U.S. Army Corps of Engineers (USACE) may be found in Manual EM385-1-1 (revised October 1987), entitled "Safety and Health Requirements Manual." Additional guidance for hazardous waste operations may be found in the EPA publication, "Standard Operating Safety Guides" (November 1987), and in the National Institute of Occupational Safety and Health (NIOSH)/OSHA/U.S. Coast Guard (USCG)/EPA publication, "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities" (October 1985).

## **II. APPLICABILITY**

The provisions of the Plan are mandatory for all official visitors, Dames & Moore employees, and subcontractors while investigations are being conducted at the site. These investigations include, but are not limited to, surveying activities, soil gas surveys, and drilling

operations to obtain samples for both geotechnical and chemical analyses. Inadequate health and safety precautions on the part of visitors or subcontractors, or the belief that personnel on the site are or may be exposed to an immediate health hazard, can be cause for Dames & Moore to suspend on-site activities and require all personnel to evacuate the hazard area.

### **III. RESPONSIBILITIES**

#### **A. Site Project Manager/Site Safety Officer**

Because of the limited number of personnel at the site, the Site Project Manager (SPM) shall function as the Site Safety Officer (SSO). The SPM/SSO shall direct all on-site investigative efforts, including the soil gas survey, soil borings, well installations, soil and water sample collection efforts, and conduct all health and safety training and daily safety inspections. A qualified Dames & Moore employee who has performed these functions many times in the past will be the designated SPM/SSO.

The SPM/SSD will report any problems or concerns to the certified industrial hygienist (CIH); the CIH is also responsible for the review and approval of modifications to the Site and Safety Plan. The CIH will also review accident reports and air monitoring data sheets; however, because these reviews are necessarily conducted after the fact, the SPM/SSO remains the principal person responsible for on-site safety. At the site, the SPM/SSO has the primary responsibility for:

Assuring that appropriate personnel protective equipment is available and properly utilized by Dames & Moore personnel, all official visitors, and subcontractor personnel.

Assuring that personnel are aware of the provisions of this plan, are instructed in the work practices necessary to ensure safety, and are aware of planned procedures for dealing with emergencies.

3. Assuring that personnel are aware of the potential hazards associated with site operations.
4. Monitoring the safety performance of all personnel to ensure that required work practices are followed.
5. Correcting any work practices or conditions that may result in injury or exposure to hazardous substances.
6. Preparing any accident/incident reports (see attached Accident Report Form).
7. Assuring the completion of Plan Acceptance and Feedback forms, attached herein.
8. Assuring that a copy of the health and safety plan is maintained on site during all field activities.



9. Assuring that all air monitoring and equipment calibrations required by the site health and safety plan are performed and recorded, and that site logs that include these activities are maintained.
10. Assuring that official site visitors and subcontractors provide the proper certifications (i.e., Fit-for-Duty and 40-Hour Health and Safety) in accordance with 29 CFR 1910.20 and ER385-1-92. These certifications will be maintained in a site visitors' log. Documents provided by subcontractors and visitors will not be inspected by Dames & Moore's board-certified occupational health physician.

**B. Project Personnel**

Project personnel involved in on-site investigations and operations are responsible for:

1. Taking all reasonable precautions to prevent injury to themselves and to their fellow employees.
2. Implementing the Site Health and Safety Plan, and reporting to the SPM/SSO any deviations from the anticipated conditions described in the Plan.
3. Performing only those tasks that they believe they can do safely, and immediately reporting any accidents and/or unsafe conditions to the SPM/SSO.

#### **IV. SITE DESCRIPTION AND BACKGROUND**

The former Raritan Arsenal is in Middlesex County, New Jersey. The site is on the banks of the Raritan River, approximately 20 miles southwest of lower Manhattan. The former arsenal is bordered to the north and northwest by Woodbridge Avenue and to the southwest by Millville Road and the ILR Landfill.

Original land features at the site included marsh areas to the south and clay pits to the north. The topography of the site generally is flat; however, there is a sharp decrease in elevation at Woodbridge Avenue, most likely the result of cut-and-fill and clay pit operations.

The Raritan Arsenal site contains approximately 3,200 acres. Within the last 25 years, the northern half of the site has been developed with the construction of numerous buildings and roadways. The southern half of the site remains primarily marshlands, with limited development, since the arsenal closed in 1963.

Before the U.S. Army purchased the site in 1917, the property consisted of farm land with several residences. The General Services Administration (GSA) sold 2,000 acres of the former arsenal to the Visceglia family in 1964; this family formed Federal Storage Warehouses. GSA then sold a parcel of land to Middlesex County, and the county developed the area into Edison County Park and Middlesex County Community College. The redeveloped land on the

former arsenal site is now mostly light industrial, warehouse, and office space in Raritan Center (2,000 acres); development is continuing in this area.

The former Raritan Arsenal site was used extensively by the U.S. Army from 1917 to 1963. Operations at the site included the storage and decommissioning of ordnance, arms, and machinery.

During this period, some waste materials, including ordnance and chemical agents (mustard gas, red fuming nitric acid, and miscellaneous chemicals), reportedly were buried on site. It also has been reported that explosive materials routinely were destroyed by surface burning or burning in chamber pits. Accidental explosions in magazine buildings and outdoor storage areas reportedly scattered explosive materials over large areas; these explosions buried ordnance fragments in the ground.

Operations at the Raritan Arsenal were phased out between 1961 and 1963. Decontamination of the site was performed under the direction of Raritan Arsenal personnel in 1963 and, later, under the Letterkenny Army Depot (LEAD) and representatives from the Army Material Command Safety Office. LEAD designated 17 areas as potentially contaminated in the study of 1963. Subsequently, the Army recommended that each site be designated either as "Unrestricted Use," "Surface Use Only," or "Non-Use," as deemed appropriate. Areas designated "Surface Use Only" and "Non-Use" included pits possibly holding potassium cyanide and mustard gas containers and areas with potentially live ordnance.

## **V. DAMES & MOORE SITE ACTIVITIES**

Dames & Moore has prepared a Work Plan to provide the necessary services to begin a Remedial Investigation. Dames & Moore field activities are described in this Work Plan entitled "Remedial Investigation/Feasibility Study (RI/FS), Former Raritan Arsenal, Edison, New Jersey, October 1991." The work areas described in the Work Plan have been segregated as Area 1 through Area 17A. Field activities in these areas may will include:

- soil gas surveys
- Unexploded ordnance (UXO) surveys;
- Surficial soil sampling;
- Soil borings and sampling;
- Monitoring well installation;
- Ground water sampling; and
- Surface water and sediment sampling.

In addition to the activities performed by Dames & Moore, a UXO reconnaissance will be performed by UXB International, Inc. (UXB). A separate Health and Safety Plan developed by UXB governing these surveys is provided as Attachment A to this document.

UXB continuously will clear all areas of invasive work throughout the field activities for UXO, mustard gas (adjacent to area 5), and other hazards to continually evaluate Personal Protective Equipment (PPE) requirements.

The tables in Appendix B were obtained from the work plan and describe the activities to be performed in Areas 1 through 12, 14, 16 and 17A. Dames & Moore will not be performing field activities in Areas 13, 15, and 18. Area 18, the GSA/EPA area will be investigated in a subsequent phase of the project. Additionally, no soil samples will be obtained in Area 5; this area is suspected of containing mustard gas, red fuming nitric acid, and other miscellaneous chemicals. Area 5 will also be investigated in a subsequent phase of the project.

## **VI. HAZARD EVALUATION**

### **A. General**

During the site investigation, it is likely the field crew will be encountering contaminated soils and/or waters. This presumption is based on information obtained from previous site studies and background information provided to Dames & Moore. Work at all areas, excluding Area 5, will begin in Level D<sup>+</sup> protection and subsequently will be governed as described in Table 3, Section XI.

The overall work hazard is described as moderate. Specific areas, including areas 4 and 5 are considered a serious hazard due to the lack of information concerning hazardous materials suspected to be present in these sites. Specific isolated, fenced-off locations within some areas of the site, such as the sulfuric acid plant in Area 6 and the fenced portion of Area 5, will not be entered by Dames & Moore.

Area 5 is considered a serious hazard because of the potential presence of potassium cyanide, red fuming nitric acid and mustard gas. Work in this area will be conducted in Level C<sup>+</sup> and continue at this level until conditions shown in Table 3, Section XI, mandate a change in the required level of protection.

**B. Potential Site Hazard**

Physical - Heat stress and fatigue are potential hazards when (1) the work is performed during hot ambient conditions or (2) Level B or C protection is worn during moderate or hot ambient conditions.

All areas will be cleared for drilling by the use of an electromagnetometer prior to drilling. There are no known underground utilities in the areas where new monitoring wells will be installed; however, this will be verified prior to invasive activities in the developed portions of the site.

**Biological** - Site hazard for biological agents; flora and fauna, at this site is expected to be low.

**Chemical** - Classes of potential and known chemical hazards at this site include:

- Corrosive,
- Ignitable,
- Volatile,
- Toxic, and
- Explosive.

A breakdown by groups of the specific chemicals previously identified or potentially on the site is listed below. The tables in Attachment B list the chemicals anticipated in each area. These tables, in conjunction with Table 3, Section II, will provide guidance for field levels of protection and activities.

<b>Volatiles</b>	-	<b>Benzene</b>
		<b>Chlorobenzene</b>
		<b>Chloroform</b>
		<b>Trans 1,2-Dichloroethylene</b>
		<b>1,1-Dichloroethane</b>
		<b>Dichlorodiethyl Sulfide (Mustard Gas)</b>

Ethylbenzene

Methylene Chloride

Tetrachloroethylene

Toluene

Trichloroethylene

Xylenes

**Metals**

-

Arsenic

Barium

Chromium

Cadmium

Lead

Mercury

Silver

**Inorganics**

-

Red fuming Nitric Acid

**Explosives**

-

2,4,6-Trinitrotoluene (TNT)

Tetryl

HMX

RDX

1,3,5-TNB



Other - Potassium Cyanide (KCN)  
 Poly Nuclear Aromatics (PNAs)  
 Polychlorinated Biphenyls (PCBs)

## VII. EMERGENCY CONTACTS AND PROCEDURES

### A. Emergency Contacts

To be established and posted on site:

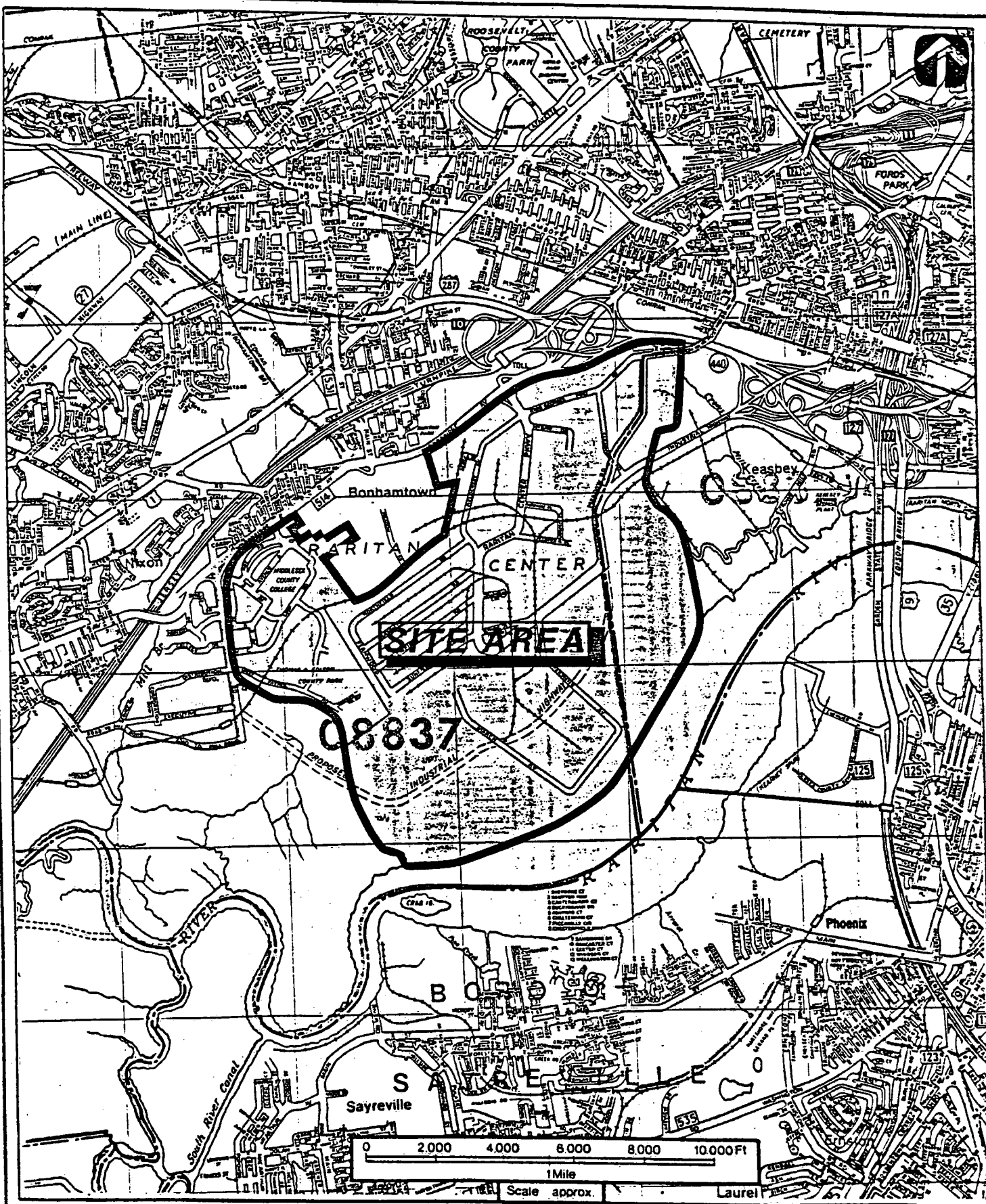
<u>Contact</u>	<u>Person</u>	<u>Number</u>
Police	City	(201) 287-0700
Fire	City	(201) 287-0100
Ambulance	Clara Barton First Aid Squad	Through Police Emergency
Hospital:	JFK Medical Center James Street Edison, NJ 08818	(201) 321-7000 For Information and Directions
<u>Dames &amp; Moore</u>		
D&M Project Manager Chicago Office Safety Coordinator	William Klaassens Denny Totzke	(708) 202-0707 (708) 202-0707
Regional H&S Manager (H&S Plan Oversight)	Tom Covilli, CIH	(913) 677-1490

**B. Location of Site Resources**

Water Supply: To be established on site; city service

**C. Emergency Route to Hospital**

Garden State Parkway, Exit 131. Go south on Route 27 1½ miles to James. Turn right on James ¼ mile to JFK Medical Center on left. These directions will be established prior to site activities, posted on site, and discussed in the site safety briefing. Site individuals will familiarize themselves with the area (see Figure 1). A local Raritan-area drawing will be posted on site with work areas delineated.



**FIGURE 1  
SITE LOCATION MAP**

**SOURCE:** Taken from Hagstrom Map:  
Middlesex County, New Jersey: 1990

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EDISON, NEW JERSEY  
FOR  
U.S. ARMY CORPS OF ENGINEERS**

**D. Special Articles to be Taken Into Field**

1. First Aid Kit
2. Organics Surveillance Device (PID)
3. Explosimeter/Methane Meter
4. Magnetometer (UX8B International)
5. Personal Air Sampling Pumps with Cyanide, Benzene, chloroform and Methylene Chloride indicators (tubes or filters)
6. M-18 (US Army issue) Test Kits for Mustard Gas (UXB International)
7. ANSI-approved eye wash kit.

**E. Emergency Procedures**

In the event that an emergency develops on site, the procedures delineated herein are to be followed immediately. Emergency conditions are considered to exist if:

- Any member of the field crew is involved in an accident or experiences any adverse effects or symptoms of exposure while on site.
- A condition is discovered that suggests the existence of a situation more hazardous than anticipated.

1. In the event that any field crew member experiences any adverse effects or symptoms of exposure while on site, the field crew shall immediately halt work and evacuate the area. The incident shall immediately be reported to the SSO and the Regional Health and Safety Manager. If the symptoms persist after leaving the site, the SSO shall contact the JFK Medical Center for advice and assistance. If the symptoms are severe, the SSO shall immediately contact the emergency number listed above and prepare the individual for evacuation to the hospital. Under no circumstances is the individual to be left unattended at the site.

After the affected individual has been properly treated, the SSO shall contact the Dames & Moore Project Manager and make a report of the incident. The SSO shall then investigate the incident to determine the probable cause. The investigation shall include discussions with the affected individual and other individuals at the site, and a reconnaissance of the area. Level B protection shall be required for the reconnaissance; under no circumstances will this reconnaissance be conducted by a single individual.

The results of the investigation shall be reported to the Project Manager. After discussions with a certified industrial hygienist and other appropriate individuals, an amended Health and Safety Plan will be prepared and discussed with the USACE. After agreement has been reached with the USACE, the amended Health and Safety Plan will be implemented.

2. In the event of an accident, the injured party shall be made as comfortable as possible and protected from the weather. In the event of a minor accident (i.e., small cuts or abrasions), appropriate medical attention shall be provided from the on-site medical kit. Major accidents involving loss of consciousness, severe bleeding, or broken bones require immediate notification to the local emergency system. Under no circumstance is the affected individual to be left unattended. In all cases of major accidents the SSO or other site personnel shall provide emergency medical assistance to stop the flow of blood from a wound, and decrease the probability of shock; the SSO shall be certified in the use of first aid.

All major accidents will require evacuation to the local emergency medical facility in Raritan, New Jersey.

After the affected individual is properly treated, the SSO shall complete the Accident Report Form for submittal to the Project Manager, with a copy to the Dames & Moore Regional Health and Safety Program office. The Project Manager shall ensure that follow-up action is taken to correct the situation that caused the accident.

3. In the event of a fire, the fire department will be contacted by using the emergency number listed above.

## **VIII. SITE SAFETY WORK PLAN**

### **A. Field Briefings and Worker Awareness**

Prior to the start of the site work, the SSO will conduct an On-Site Safety Briefing. This meeting will be repeated as necessary to accommodate new arrivals, changes in the work plan, or amendments to the Health and Safety Plan. At each meeting, an On-Site Safety Briefing Form (Section X) will be completed. All on-site individuals will be provided with and will be expected to read this Site-Specific Health and Safety Plan prior to starting on site activities. In addition, individuals working on this project must complete the Plan Acceptance Form (Section X).

Visitors to the site will be provided with the Health and Safety Plan, will be briefed individually, and also will be expected to complete the Plan Acceptance Form. All visitors will be expected to comply with the provisions of the Health and Safety Plan for the well-being of all.

Following initial site reconnaissance and exposure surveillance, exclusion zones will be established both physically and on posted site maps.

**B. Air Monitoring**

Air monitoring will be conducted for the hazards presented in Table 1. Equipment necessary for exposure monitoring at this site includes organic surveillance devices (PID) and toxic air samplers for cyanide and benzene. The types of monitoring instruments specified by the hazard and the action levels to upgrade personnel protection are shown in Table 3. All monitoring equipment will be maintained following procedures outlined in the Dames & Moore Standard Operating Manual for Monitoring Equipment.

The PID is selected because it can detect most of the volatile organic compounds and some inorganic compounds. Additionally, a PID does not detect methane gas, so it will not be affected by the existence of methane gas in organic soils such as topsoils or peat. Calibration and maintenance of the monitoring equipment will be in accordance with the manufacturer's recommendations; the PID will be calibrated daily.

Dames & Moore will obtain a background level for organic vapors before beginning any drilling or sampling activities; this background level shall be obtained at the boring or sampling location. During drilling and sampling activities, additional readings will be obtained from auger cuttings, the borehole, and the breathing zone. Records of all measurements will be noted in the field log book.



Personnel protection requirements (i.e., the need for respiratory protection) will be based on sustained readings (as determined by the SSO) of the surveillance devices and visual observations. Refer to Table 3 for action levels and Table 4 for the equipment gear needed for various levels of protection.

The ambient air and the boreholes also will be monitored periodically with an MSA Model 2A or 53 explosimeter. This instrument is used primarily to determine if the atmosphere contains vapors or gases in sufficient quantities to be explosive. If the instrument registers more than 25 percent of the lower explosive limit, the area will be evacuated.

All site personnel will remember that the absence of organic vapors does not indicate the absence of contamination; the majority of the contaminants, previously detected at the site are not volatilized easily. Appropriate precautions are required to prevent inhalation of, ingestion of, or skin contact with contaminated dust particles. If dusty conditions are encountered, respirators with high-efficiency dust filters will be used while drilling for the installation of monitoring wells, or obtaining soil samples. Because of conditions at the site (including a high ground water table in much of the site, and the types of soil noted during the site reconnaissance) dusty conditions caused by the investigation are considered unlikely.

**C. Levels of Protection**

The level of protection needed to perform work on site will begin in Level D<sup>+</sup>, but may be upgraded if conditions warrant, as described in Table 3. The appropriate dress for Level D<sup>+</sup> and Level C protection is described in Table 4.

**D. Respiratory Protection**

If air-purifying respirators are authorized, combination organic vapor/dust/acid mist cartridges are appropriate for use with the anticipated substances and concentrations. Refer to Table 3 for conditions that warrant the donning of respirators.

All personnel working in the field have been trained properly, fit tested, and declared fit for respirator use.

**E. Work Limitations**

In general, field work will be conducted during daylight hours only. At least two personnel will be in the field at all times. The SPM or SSO must grant special permission for any field activities conducted beyond daylight hours.

**F. Training**

All site personnel currently are enrolled in the Dames & Moore continuous training program in accordance with 29 CFR 1910.120. Individuals working on this site have completed an approved 40-hour Hazardous Waste Site Operations Course. In addition, each worker must complete annual, 8-hour refresher courses and an 8-hour Supervisor's Course. Dames & Moore field staff are current in first aid and CPR requirements. Dames & Moore employee records are on file in the employees' home office. The SSO will conduct site specific training and safety meetings (weekly) and maintain a log of the meetings.

**G. Medical Surveillance Program**

Each site worker must be designated as physically fit-for-duty, as evidenced by the successful completion of the authorized Dames & Moore physical examination.

All Dames & Moore field employees participate in a medical surveillance program which includes entry-, annual-, and exit medical examinations. Records of these exams, as well as exposure histories, are maintained at the Dames & Moore Health Group in Denver, Colorado. This program is under the overall direction of Dr. Gary Krieger, M.D., a board-certified occupational health physician.

## **H. Heat Stress**

Heat stress can be a problem if site activities are required to be performed in Level C- or Level B protection. Dames & Moore follows the guidelines set forth in the three-agency document, "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities," DHHS (NIOSH) Publication No. 85-115. All Dames & Moore personnel working on the site have a copy of this document; additionally, a copy of this document will be present at the site.

## **IX. DECONTAMINATION PROCEDURES**

### **A. Establishment of Decontamination Zones and Stations**

Personnel will follow the standard decontamination procedures outlined below.

1. Locate a decontamination area.
2. Establish a personnel decontamination station consisting of a basin with soapy water, a rinse basin with plain water, and a can with a plastic bag.
3. Proceed through the appropriate contamination reduction sequence, as described below, upon leaving the area of contamination.

4. Wash and rinse boots.
5. Remove outer gloves and discard in plastic bag.
6. Remove disposable suit and discard in plastic bag.
7. Leave all protective gear on site during lunch break following decontamination procedures.

#### Maximum Measures for Level C Decontamination

Station 1: Segregated Equipment  
Drop

1. Deposit equipment used on site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths or in different containers with plastic liners. Segregation at the drop reduces the probability of cross-contamination. During hot weather operations, a cool-down station may be set up within this area.

- |            |                               |    |  |
|------------|-------------------------------|----|--|
| Station 2: | Boot Cover and<br>Glove Wash  | 2. | Scrub outer boot covers and gloves<br>with decon solution of detergent and<br>water.                     |
| Station 3: | Boot Cover and<br>Glove Rinse | 3. | Rinse off decon solution from Station<br>2 using copious amounts of water.                               |
| Station 4: | Tape Removal                  | 4. | Remove tape around boots and<br>gloves and deposit in container with<br>plastic liner.                   |
| Station 5: | Boot Cover Removal            | 5. | Remove boot covers and deposit in<br>container with plastic liner.                                       |
| Station 6: | Outer Glove Removal           | 6. | Remove outer gloves and deposit in<br>container with plastic liner.                                      |
| Station 7: | Suit, Glove, and<br>Boot Wash | 7. | Wash splash suit, gloves, and safety<br>boots. Scrub with long-handle scrub<br>brush and decon solution. |

- |             |                                |     |   |
|-------------|--------------------------------|-----|---|
| Station 8:  | Suit, Glove, and<br>Boot Rinse | 8.  | Rinse off decon solution using water.<br>Repeat as many times as necessary.   |
| Station 9:  | Canister or Mask Change        | 9.  | Perform last step in the<br>decontamination procedure (if<br>worker is leaving exclusion zone to<br>change canister or mask). Worker's<br>canister is exchanged, new outer<br>gloves and boot covers donned, and<br>joints taped; worker returns to duty. |
| Station 10: | Safety Boot Removal            | 10. | Remove safety boots and deposit in<br>container with plastic liner.   |
| Station 11: | Splash Suit Removal            | 11. | Remove splash suit with assistance<br>of helper. Deposit in container with<br>plastic liner.  |
| Station 12: | Inner Glove Wash               | 12. | Wash inner gloves with decon<br>solution.   |
| Station 13: | Inner Glove Rinse              | 13. | Rinse inner gloves with water.  |

**Station 14: Face Piece Removal**

**14. Remove face piece. Deposit in container with plastic liner. Avoid touching face with fingers.**

**Station 15: Inner Glove Removal**

**15. Remove inner gloves and deposit in lined container.**

**Station 16: Inner Clothing Removal**

**16. Remove clothing soaking with perspiration and place in lined container. Do not wear inner clothing off site since there is a possibility that small amounts of contaminants might have been transferred when removing the disposable coveralls.**

**Station 17: Field Wash**

**17. Shower if highly toxic, skin-corrosive, or skin-absorbable materials are known or suspected to be present. Wash hands and face if shower is not available.**



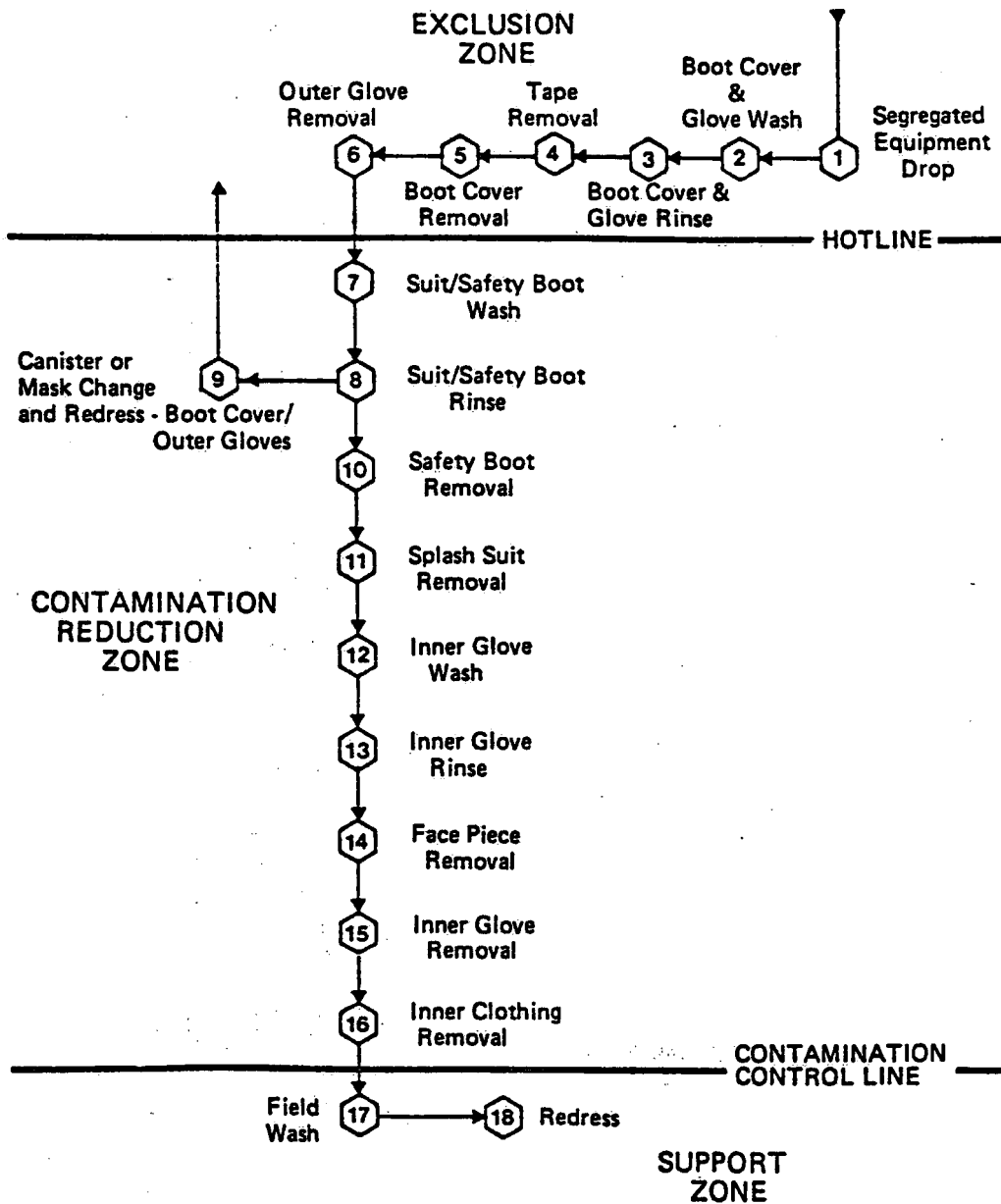
Station 18: Redress

18. Put on clean clothes.

PROCESS DECON PROCEDURES

MAXIMUM DECONTAMINATION LAYOUT

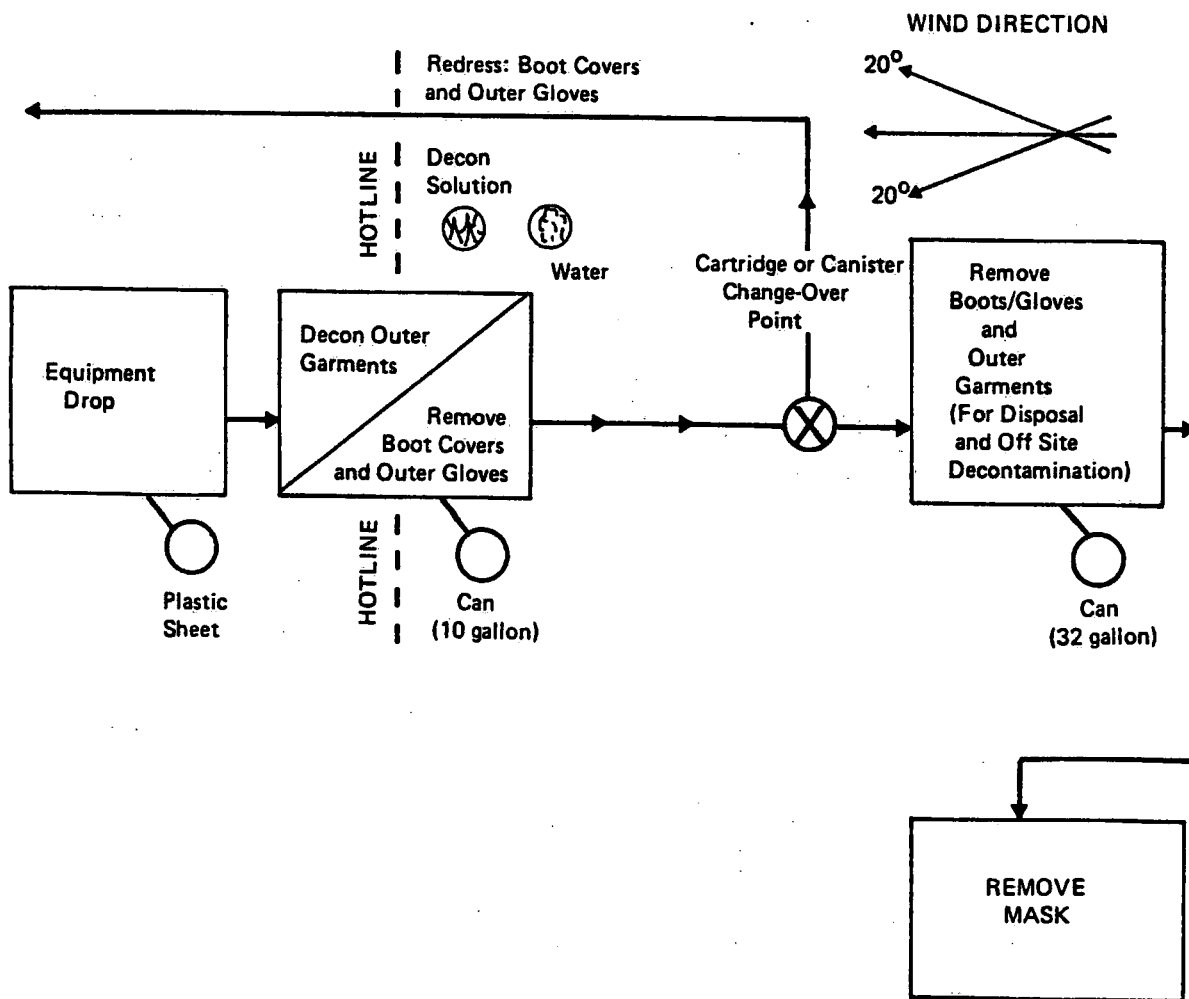
LEVEL C PROTECTION



PROCESS DECON PROCEDURES

MINIMUM DECONTAMINATION LAYOUT

LEVEL C PROTECTION



### **Minimal Decontamination**

Less extensive procedures for decontamination can be established SPM/SSO after discussion with the CIH when the type and degree of contamination becomes known or the potential for transfer is judged to be minimal. These procedures generally involve one or two washdowns only. The layout for a minimal decontamination operation is shown in the attached diagram.

### **Emergency Decontamination**

In the event a worker is involved in an accident and injured, emergency decontamination procedures will be executed and medical attention obtained immediately.

Portable wash stations and eye wash will be available in the event a worker becomes contaminated with an extremely toxic or corrosive material.

### **Closure of the Personnel Decontamination Station**

All disposable clothing and plastic sheeting used during the operation will be double-bagged and contained on site prior to removal to an approved off-site disposal facility. Decon and rinse solution will be contained on site prior to disposal as stated in Section 13.0 of the Work Plan. Reusable rubber clothing will be dried and prepared for future use. If

contamination of non-disposable clothing has occurred, the item will be discarded. Cloth items will be bagged and removed from the site for final cleaning. All wash tubs, pail containers, etc., will be thoroughly washed, rinsed, and dried prior to removal from the site.

**B. Personal Hygiene**

**For Personnel Breaks (Rest Breaks)**

It is anticipated that personnel breaks will be conducted adjacent to but out of the work area. Personnel at the site shall remove outer boots and place them in a plastic bag (these boots may be reworn if not torn). Remove all gloves and place them in a plastic bag. During the break, team members should avoid touching potentially contaminated objects such as their coveralls. Smoking and eating are specifically prohibited during these rest breaks.

**For Leaving the Site Area (During Lunch Break or When Closing the Personnel Decon Station at the End of the Day)**

Wash boots in Alconox® and water, rinse, and dry with paper towels. Alternately, wear disposal over-boots when on site, remove, and place in a plastic bag for reuse or disposal. If disposable boots or gloves are to be reused, they must be decontaminated first by washing with Alconox® and water. Remove coveralls (Tyvek® suits) and gloves;

place in a plastic bag for disposal. As soon as possible, thoroughly wash hands, face, and other exposed portions of the body with soap and water. Because of the nature of the known contaminants at the site, the primary means of absorption are through ingestion (i.e., deposited on food by hand contact), skin contact, or respiration; the importance of thoroughly washing exposed skin areas cannot be over-emphasized. Shower and shampoo as soon as possible at the end of the day. All clothing worn at the site, including jackets and hats, should be laundered before wearing for any activities outside the project. If respiratory protection is required, respirators should be cleaned and sanitized at least once a day.

**C. Equipment**

All sampling equipment will be decontaminated prior to use, between samples, and at the end of the sampling activities to avoid cross-contamination, and to decrease personnel contact with contaminated material and the probability of removing contamination from the site. The details of decontamination can be found in the Work Plan and Chemical Data Acquisition Plan.

It is the responsibility of the SSO to ensure that all equipment leaving the site has been decontaminated properly. Documentation of decontamination must be made in the field log book that will become part of the permanent project file. The equipment number or

description must be written in the field log book when the equipment leaves the site, along with a notation that specified decontamination procedures have been followed.

Vehicle decontamination will be limited to steam-cleaning of all soil contact surfaces (tires, pads, augers, etc.). Decontamination of the drill rig will be done prior to moving the rig to another boring location.

The decontamination wastes generated by cleaning the vehicles will be disposed of as stated in Section 13.0 of the Work Plan.

#### **Decontamination of Air Monitoring Equipment**

Careful handling of air monitoring equipment should prevent its contamination. If site conditions/activities are such that air monitoring instrumentation may become contaminated, the equipment will be placed in a clear plastic bag which is taped around the instrument. Openings will be made in the bag for sample intake. If, however, equipment becomes contaminated with substances that cannot be removed by normal decontamination procedures, an analytical chemist will be contacted to assist in developing a decontamination procedure.

## **Disposal of Decontamination and Other Wastes**

All disposable clothing and other wastes generated during decontamination other than decontamination fluids (refer to Section 13.0 of the Work Plan) will be put into 55-gallon drums; the drums will be fully-opening with a top cover bung (type 17E/H). The drums will be filled partially or completely, depending upon the difficulty of transporting them from the work site. All containers will be numbered and clearly labeled with the boring/well number and date of filling. The mixing of solid and liquid wastes will be avoided. The containers will be stored at the site for disposal when the analyses of the samples have been obtained.

## **X. FORMS**

A standard packet of health and safety forms will be supplied to the SPM/SSO. These forms include:

<u>FORM</u>	<u>TO BE COMPLETED BY</u>
1. Site Safety Briefing	The SPM/SSO
2. Plan Acceptance	All D&M employees working on this site
3. Plan Feedback	SPM/SSO and any other on-site employee who wishes to do so
4. Accident Report	SPM/SSO
5. Exposure History	All site personnel



- |    |  |  |
|----|--|--|
| 6. | Daily Instrument Calibration                           | SPM/SSO or user  |
| 7. | Air Monitoring Log                                     | Assigned field personnel   |
| 8. | Amendments to the Site-Specific Health and Safety Plan | SPM/SSO and approved by the Corporate Certified Industrial Hygienist |

## **XI. TABLES**

Table 1 Exposure Limits and Recognition Qualities

Table 2 Acute and Chronic Effects and First Aid Treatment

Table 3 Hazard Monitoring Methods, Action Levels, and Protective Measures

Table 4 Protective Equipment for On-Site Activities

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TABLE 1

## EXPOSURE LIMITS AND RECOGNITION QUALITIES

COMPOUND	EXPOSURE STANDARD <sup>a</sup>	IDLH LEVEL <sup>b</sup>	RECOGNITION QUALITIES			ODOR WARNING CONCENTRATION (ppm)	LEL <sup>c</sup> (%)	UEL <sup>d</sup> (%)	IONIZATION POTENTIAL (eV)
			COLOR	ODOR	STATE				
Volatiles:									
Benzene	10 ppm	Ca <sup>e</sup>	Colorless	Aromatic	Liquid	1.5-5	1.37	19.25	9.25
Ethylbenzene	100 ppm	2000 ppm	Colorless	Aromatic	Liquid	4.7-50	1.00	6.70	8.76
Toluene	200 ppm	2000 ppm	Colorless	Aromatic	Liquid	.17-40	1.37	18.82	8.82
Xylene	100 ppm	1000 ppm	Colorless	Aromatic	Liquid	1-1.5	1.16	8.56	8.50
Methylene Chloride	100 ppm	Ca	Colorless	Sweet	Liquid	100 ppm	12.0	19.0	11.35
1,2-Dichloroethylene	200 ppm	4000 ppm	Colorless	Acrid	Liquid	1	5.6	12.8	9.65
1,1-Dichloroethane	100 ppm	4000 ppm	Colorless	Chloroform	Oily	120	5.6	-	11.06
Chloroform	2 ppm	Ca	Colorless	Pleasant	Liquid	50	-	-	11.42
Chlorobenzene	75 ppm	2400 ppm	Colorless	Almond	Liquid	60	1.3	9.6	9.07
Tetrachloroethylene	25 ppm	Ca(500 ppm)	Colorless	Chloroform	Liquid	5	-	-	9.32
Trichloroethylene	25 ppm	Ca(1000 ppm)	Colorless	Chloroform	Liquid	21	8	10.5	9.45
Dichlorodiethyl Sulfide (Mustard Gas)	Lowest Possible Exposure	Ca	Pale Yellow	Pungent	Oily	.19	-	-	-
Metals:									
Arsenic	10 mg/m <sup>3</sup>	Ca	Variable	Variable	Solid	-	-	-	-
Barium	.5 mg/m <sup>3</sup>	250 mg/m <sup>3</sup>	Variable	Variable	Solid	-	-	-	-
Cadmium	.5 mg/m <sup>3</sup>	Ca	Variable	Variable	Solid	-	-	-	-
Chromium	1 mg/m <sup>3</sup>	500 mg/m <sup>3</sup>	Variable	Variable	Solid	-	-	-	-
Lead	.1 mg/m <sup>3</sup>	Minimum	Variable	Variable	Solid	-	-	-	-
Mercury	.5 mg/m <sup>3</sup> (skin)	28 mg/m <sup>3</sup>	Silver-White	Odorless	Liquid	-	-	-	-
Silver	.1 mg/m <sup>3</sup>	-	White	-	Solid	-	-	-	-
Inorganics:									
Nitric Acid (Red Fuming)	2 ppm	100 ppm	Red/Yellow	Acrid	Liquid	1	-	-	11.95

TABLE 1 (Continued)

## EXPOSURE LIMITS AND RECOGNITION QUALITIES

COMPOUND	EXPOSURE STANDARD <sup>a</sup>	IDLH LEVEL <sup>b</sup>	RECOGNITION QUALITIES			ODOR WARNING CONCENTRATION (ppm)	LEL <sup>c</sup> (%)	UEL <sup>d</sup> (%)	IONIZATION POTENTIAL (eV)
			COLOR	ODOR	STATE				
Polychlorinated Biphenyls (PCBs):									
Aroclor 1242	1 mg/m <sup>3</sup>	Ca	Yellow to Brown	Mild Hydrocarbon	Viscous Liquid	-	-	-	-
Aroclor 1254	.5 mg/m <sup>3</sup>	Ca	Yellow	Mild Hydrocarbon	Viscous Liquid	-	-	-	-
PolyNuclear Aromatics (PNAs)									
Benzo (a) anthracene Benzo (b) fluoranthene Fluoranthene Benzo (a) pyrene Indeno (1,2,3-cd) pyrene Pyrene Phenanthrene Chrysene	.2 mg/m <sup>3</sup>	Ca	Variable	Variable	Solids	Naphtha	-	-	-
Explosives									
2,4,6-Trinitrotoluene (TNT)	.5 mg/m <sup>3</sup>	-	Pale Yellow	Odorless	Solid	-	-	-	10.6
Tetryl	1.5 mg/m <sup>3</sup>	-	Yellow	Odorless	Solid	-	-	-	-
HMX	-	-	-	-	-	-	-	-	-
RDX	-	-	-	-	-	-	-	-	-
1,3,5-TNB	-	-	-	-	-	-	-	-	-
Toxic Gas:									
Potassium Cyanide	5 mg/m <sup>3</sup>	50 mg/m <sup>3</sup>	White	Almond	Solid	-	-	-	-

<sup>a</sup> OSHA permissible exposure limit or American Conference of Governmental Industrial Hygienists (ACGIH)

Threshold Limit Value - Time Weighted Average (TWA)

<sup>b</sup> Immediately dangerous to life or health

<sup>c</sup> Lower explosive limit

<sup>d</sup> Upper explosive limit

<sup>e</sup> To be treated as a carcinogen

NOTE: The odor warning concentrations given are generally odor thresholds with irritation thresholds given in parentheses

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**TABLE 2**

**ACUTE AND CHRONIC EFFECTS  
SYMPTOMS OF OVEREXPOSURE AND FIRST AID TREATMENT**

COMPOUND	SYMPTOMS OF OVEREXPOSURE	FIRST AID TREATMENT
Benzene	Irritation to eyes; nose; respiratory systems; giddiness; headache; nausea; staggered gait; fatigue; anorexia; lassitude; dermatitis; bone marrow depressant/depression; abdominal pain; (carcinogenic)	Eye: Irrigate immediately Skin: Soap wash promptly Inhalation: Artificial respiration Ingestion: Medical attention immediately; DO NOT INDUCE VOMITING
Ethylbenzene	Irritation to eyes, mucous membranes; headache; dermatitis; narcosis; coma	Eye: Irrigate immediately Skin: Soap wash promptly Inhalation: Artificial respiration Ingestion: Medical attention immediately
Toluene	Fatigue; weakness; confusion; euphoria; dizziness; headache; dilated pupils; lacrimation; nervousness; muscle fatigue; insomnia; paresis; dermatitis; photophobia	Eye: Irrigate immediately Skin: Soap wash promptly Inhalation: Move to fresh air Ingestion: Medical attention immediately; DO NOT INDUCE VOMITING
Xylene	Dizziness; excitement; drowsiness; incoordination; staggering gait; irritation of eyes, nose, throat; corneal vacuolization; anorexia; nausea; vomiting; abdominal pain; dermatitis	Eye: Irrigate immediately Skin: Soap wash promptly Inhalation: Move to fresh air Ingestion: Medical attention immediately; DO NOT INDUCE VOMITING

TABLE 2 - Continued

COMPOUND	SYMPTOMS OF OVEREXPOSURE	FIRST AID TREATMENT
Methylene Chloride	Fatigue; weakness; drowsiness; lightheadedness; tingling; numb limbs; nausea; irritated eyes and skin; vertigo; worsen angina; skin; CUS; eyes; CNS	Eye: Irrigate immediately Skin: Soap wash promptly Inhalation: Artificial respiration Ingestion: Medical attention immediately
Chloroform	Dizziness; dullness; nausea; disorientation; headache; fatigue; irritation to eyes and skin; fainting	Eye: Irrigate immediately Skin: Soap wash promptly Inhalation: Artificial respiration Ingestion: Medical attention immediately
Chlorobenzene	Irritated skin, eyes and nose; drowsiness; incoherence	Eye: Irrigate immediately Skin: Soap wash promptly Inhalation: Artificial respiration Ingestion: Medical attention immediately
1,1-dichloroethane	Central nervous system depression; skin irritation; liver and kidney damage	Eye: Irrigate immediately Skin: Soap wash promptly Inhalation: Artificial respiration Ingestion: Medical attention immediately
1,2-dichloroethylene	Irritated eyes and respiratory system; depression; central nervous system	Eye: Irrigate immediately Skin: Soap wash promptly Inhalation: Artificial respiration Ingestion: Medical attention immediately
Tetrachloroethylene	Irritation to eyes, nose, and throat; nausea; flush face and neck; vertigo; dizziness; incoherence; headaches	Eye: Irrigate immediately Skin: Soap wash promptly Inhalation: Artificial respiration Ingestion: Medical attention immediately

TABLE 2 - Continued

COMPOUND	SYMPTOMS OF OVEREXPOSURE	FIRST AID TREATMENT
Trichloroethylene	Headaches; vertigo; visual distortion; tremors; nausea; vomiting; irritation to eyes; dermatitis	Eye: Irrigate immediately Skin: Soap wash promptly Inhalation: Artificial respiration Ingestion: Medical attention immediately
Dichlorodiethyl Sulfide (Mustard Gas)	Eye, skin, and lung irritation; pulmonary lesions; cardiovascular damage; gastric discomfort	Eye: Irrigate immediately Skin: Soap wash promptly Inhalation: Artificial respiration Ingestion: Medical attention immediately
2,4,6-Trinitrotoluene (TNT)	Liver damage; jaundice; sneezing; coughing; sore throat; muscle pain; sensitive skin; anemia; cardiovascular irregularities	Eye: Irrigate immediately Skin: Soap wash promptly Inhalation: Artificial respiration Ingestion: Medical attention immediately
Tetryl	Sensitive skin; itching, sneezing, nasal irritation; anemia, fainting; coughing; nausea; vomiting; headache	Eye: Irrigate immediately Skin: Soap wash promptly Inhalation: Artificial respiration Ingestion: Medical attention immediately
Potassium Cyanide	Asphyxiation; weakness; headache; confusion; nausea; vomiting; irregular breathing rate; irritated eyes and skin; gasping for breath; death	Eye: Irrigate immediately Skin: Soap wash promptly Inhalation: Artificial respiration Ingestion: Medical attention immediately

**TABLE 2 - Continued**

COMPOUND	SYMPTOMS OF OVEREXPOSURE	FIRST AID TREATMENT
Nitric Acid	Irritated eyes, mucus membranes and skin; bronchitis and dental erosion	Eye: Irrigate immediately Skin: Soap wash promptly Inhalation: Artificial respiration Ingestion: Medical attention immediately
PNAs	Dizziness; nausea; irritated nose and respiratory tract; burning membranes; vomiting; bronchial spasms; burning skin; dermatitis; weak pulse	Eye: Irrigate immediately Skin: Soap wash promptly Inhalation: Artificial respiration Ingestion: Medical attention
Metals	Tight chest; coughing; chills; muscle aches; diarrhea; muscle spasms; slow pulse; irritated and burning eyes and skin	Eye: Irrigate immediately Skin: Soap wash promptly Inhalation: Artificial respiration Ingestion: Medical attention
PCBs	Dermatitis; chlorine; blurred vision; nausea; vomiting; diarrhea; headache	Eye: Irrigate immediately Skin: Soap wash promptly Inhalation: Artificial respiration Ingestion: Medical attention

TABLE 3

**HAZARD MONITORING METHODS, ACTION LEVELS,  
AND PROTECTIVE MEASURES**

HAZARD	MONITORING METHOD	ACTION LEVEL	PROTECTIVE MEASURES	MONITORING SCHEDULE
Toxic Vapors	PID (10.6 EV Lamp)  Detector Tubes: Benzene Chloroform Methylene Chloride	(1) Measurable Above Background Based on Judgement of SSO up to 50ppm and  < 1 ppm < 1 ppm < 25 ppm	Level D+ (see Table 4)	• Continue drilling with Continuous monitoring/ every sample retrieved
	PID (10.6 EV Lamp)  Detector Tubes: Benzene Chloroform Methylene Chloride	Measurable Above Background Based on Judgement of SSO 50 ppm to 100 ppm and  < 10 ppm < 10 ppm < 25 ppm	Don full-face respirator with organic vapor cartridge and high-efficiency dust and mist filters Level C (see Table 4)	• Continue drilling with Continuous monitoring/ every sample retrieved
	PID (10.6 EV Lamp)  Detector Tubes: Benzene Chloroform Methylene Chloride	Measurable Above Background Based on Judgement of SSO > 100 ppm or  > 10 ppm > 10 ppm > 25 ppm	STOP WORK EVACUATE AREA NOTIFY PROJECT MANAGER	• Level C protection will be required to continue work under these conditions
Toxic Dust PCBs; PNAs; Metals	Visual Observation	Dusty Conditions	**Don full-face respirator with organic vapor cartridge and high-efficiency dust and mist filters	
Explosive Atmosphere (gaseous)	Explosimeter	0-10% LEL	Continue drilling	• Continue monitoring bore hole every 10 minutes/ every sample retrieved
		10% to 25%	Continue drilling	• Continuous monitoring/ every sample retrieved
		> 25% LEL	EVACUATE AREA EXPLOSION HAZARD NOTIFY PROJECT MANAGER	
Cyanide (Arca 5)	Cyanide detector tubes	< 2 mg/m <sup>3</sup>	Continue working in Level D	• Monitor every 15 minutes and every sample retrieved
	Cyanide detector tubes	> 2 mg/m <sup>3</sup>	Level B protection is required	• Notify Project Director and cease site work, vacate area
Mustard Gas	M-18 test kits	Measurable above background		• Vacate area immediately, notify Project Director and Army Corps

**NOTES:**

- (1) The above action levels are not solely based on the criteria for selecting levels of protection by the 1984 EPA Standard Operating Procedures, but also on the professional judgement and experience of the On-Site Safety Officer (OSSO).
- \*\* Super windy or dusty conditions exist. The area should be hosed down to try to minimize the potential for the inhalation of contaminated dust.
- \*\*\* If encountered in a boring hole or monitoring well, purge boring or well with nitrogen until safe levels (< 10% LEL) are obtained. If 25% LEL persists, abandon boring and evacuate area temporarily. After at least 1/2 hour, re-approach borehole from an upwind direction while continuously monitoring well explosimeter. If levels are still unsafe, backfill hole and abandon.



**TABLE 4****PROTECTIVE EQUIPMENT FOR ON-SITE ACTIVITIES**

ACTIVITY	LEVEL	PROTECTIVE EQUIPMENT
Drilling and Sampling	D+	<ul style="list-style-type: none"><li>• Hard hat</li><li>• Goggles or splash shield</li><li>• Steel-toed rubber boots or steel-toed boots with chemical resistant booties</li><li>• Outer gloves (Nitrile) and inner (latex) gloves</li><li>• Joints between gloves, boots, hood and suit must be taped</li></ul>
Drilling and Sampling	C	Same as above plus: <ul style="list-style-type: none"><li>• Tyvek suits properly fitted and taped</li><li>• Full-face respirator with organic vapor cartridge/high efficiency dust and acid mist filters</li></ul>
All work in Area 5	C+	<ul style="list-style-type: none"><li>• Same as C with Syranek suit in place of Tyvec</li></ul>
Drilling and Sampling	B	<ul style="list-style-type: none"><li>• Same as C or C+; however, SCBA required with escape pacs</li></ul>

The selection of protective equipment can be modified for various field activities based on the professional experience and judgement of the On Site Safety Officer (OSSO).

**ATTACHMENT A**

**UXB'S HEALTH AND SAFETY PLAN**

SUBMITTED TO:

DAMES and MOORE

1550 Northwest Highway

Park Ridge, Il. 60068

SAFETY PLAN SUPPLEMENT for

Former Raritan Arsenal, Edison, New Jersey

Feasibility Study (RI/FS)

April 1991

SUBMITTED BY:

UXB INTERNATIONAL, INC.

14800 CONFERENCE CENTER DRIVE,

SUITE 100

CHANTILLY, VIRGINIA 22021-3806

Former Raritan Arsenal,  
Unexploded Ordnance (UXO)  
Safety Plan Supplement

1. INTRODUCTION

UXB International, Inc. (UXB) has developed this Health and Safety Plan Supplement for Dames and Moore (D&M) for the purpose of conducting Unexploded Ordnance (UXO) reconnaissance during intrusive and non-intrusive investigations within the boundaries of Former Raritan Arsenal, Edison, New Jersey. The following pages of this supplement are developed to address procedures, and safety protocols for investigations in potential UXO areas.

\*\*\*\*\*

WARNING

Former Raritan Arsenal, Area #5 is a disposal site for Military Chemical Surety Materials and Agent.

This UXO Safety Supplement does not authorize chemical ordnance investigations.

Operations by UXB within the boundaries of Area #5 are not authorized by this Safety Supplement.

If a chemical agent item is encountered on the Arsenal at any time, withdraw upwind from the location, secure the site and notify the U.S. Army Corp of Engineer Representative.

WARNING

\*\*\*\*\*

## 1.1 PERSONNEL

Resumes and Certificates for the following personnel are provided in section four. UXB personnel for this project are all graduates of the U.S. Naval School of Explosive Ordnance Disposal, Indian Head, Maryland. UXB team personnel are all honorably discharged military members and have never been de-certified under the military Personal Reliability Program. UXB personnel are all graduates of Hazardous Waste and Emergency Response Operations training in accordance with Code of Federal Regulations (CFR) Part 29, Section 1910.120 and are enrolled in a medical surveillance program.

The following personnel meet and exceed the minimum requirements listed in the statement of work.

UXB UXO Site Supervisor	Mr. David Dyess
UXB UXO Specialist	Mr. Dan Stephens
UXB UXO Specialist	Mr. Bruce Moe

## 1.2 PERSONNEL ASSIGNMENTS

The U.S. Army Corps of Engineers (USACE) requires two UXO Technicians for UXO field operations where intrusive investigations will take place. This supplement recognizes the two man concept for each intrusive procedure addressed.

a. SITE SUPERVISOR - The UXB Site Supervisor (UXBSS) has overall responsibility for UXB personnel and their performance while on site. The UXBSS is responsible for complying with the procedures and techniques addressed in the D&M Health and Safety Plan and this supplement. THE UXBSS coordinates field tasks and schedules with the D&M Project Manager (PM) on a daily basis.

The UXBSS receives guidance and instructions from D&M PM for site actions to exclude UXO operational safety. The UXBSS will coordinate site activities from the D&M Command Post and maintain a radio link with the D&M Safety Officer (SO). The UXBSS is dedicated to the project during UXO operational tasks. The UXBSS is responsible for determining the final hazard assessment on all UXO encountered.

b. UXO TECHNICIANS - TWO UXO qualified personnel responsible for safely conducting escort and intrusive operations as assigned by the UXBSS.

This UXB two-person team can safely support one intrusive investigation and two non-intrusive activities. Each additional intrusive investigation will require an additional two man team.

### 1.3 PERSONAL PROTECTION EQUIPMENT

Personal Protection Equipment (PPE) for UXB personnel is Level D during UXO search and escort. Upgrade is required to a modified or higher level of protection through field monitoring results or site specific guidance of the Health Safety Plan.

### 1.4 EQUIPMENT

The following major equipment items will be required during the investigation phase:

<u>EQUIPMENT</u>	<u>NUMBER</u>
White's Eagle II Metal Detector	1
Foerster Ferex Ordnance Locator	1
EOR/Survey Kit	1
Trucks P/U 1/2 ton	2
Motorola HT-90 Portable Radios	4
Cellular Telephone	1
Level D PPE	Multiple

## 2.0 TECHNICAL APPROACH

There are two basic methods of search for an area suspected of unexploded ordnance (UXO) contamination. These methods are:

a. GEOPHYSICAL SEARCH - Using magnetometers or metal detectors to examine the surface and subsurface area in a non-intrusive manner.

b. VISUAL SEARCH - Usually conducted simultaneously with the above methods. Entails visually observing the areas being searched to locate ordnance on the surface or surface indications of the presence of subsurface ordnance (e.g. projectile entry holes or burial trenches).

The two survey methods described above will be used alone or in combination to conduct investigations depending on the specific operation to be conducted (e.g. well installation, shallow soil sampling and escort).

### 2.1 GEOPHYSICAL SEARCH

USACE requires that two distinct methods of geophysical survey be conducted. The Foerster Ferex Ordnance Locator will be used, in conjunction with the White's commercial metal detector, for all subsurface geophysical surveys. The following are descriptions of these two electronic detectors:

a. Foerster Ferex Electromagnetic Detector - The Foerster Ferex Ordnance Locator is the most recent military approved locator and is in use by the U.S. Military EOD forces, designated the MK 26 Ordnance Locator, for detecting subsurface ordnance items. The locator is a hand-held unit and uses 2 flux-gate magnetometers, aligned and mounted a fixed distance apart to detect changes in the earth's ambient magnetic field caused by ferrous metals.

Both an audio and metered signal are provided to the operator. The metered signal indicates whether the disturbance is geodetic or metal-related. The detection capability of the Foerster Ferex is dependent on the size of the item versus its depth.

The Foerster Ferex is capable of ordnance location to the following depths:

ITEM	DEPTH
Small Arms Round	1 ft
Hand Grenade	2 ft
Anti-Personnel Mine	3 ft
Anti-Tank Mine	4.5 ft

ITEM	DEPTH
Medium Projectile	10 ft
Small Bomb	15 ft
Large Bomb	19 ft

Although the Foerster Ferex Ordnance Locator will detect disturbances caused by changes in soil conditions, its ability to detect metallic items is not affected by local soil conditions.

b. WHITE'S EAGLE II METAL DETECTOR - A man-carried, microprocessor controlled metal detector with a Liquid Crystal Display and a keypad user interface. This metal detector operates on the induction principle whereby a transmitter coil induces eddy currents within buried metal and these induced eddy currents are received by a receiver unit. The advantage of this detector is that it can detect both ferrous and non-ferrous metals.

The instruments detailed above will be used, during investigations, to locate subsurface metallic objects and UXO. They are very effective in areas where there is sparse to heavy metallic contamination and, conversely, of limited usefulness in areas that are contaminated with thick layers of miscellaneous metallic debris, such as landfills.



Sites at Raritan Arsenal are known not to be heavily contaminated with metallic debris on the surface, normal geophysical survey methods can be used. The following types of geophysical searches will be employed throughout the Arsenal investigation sites.

1. UXO Technician Escort Services for Samplers - To ensure the safety of all field samplers working in an area suspected to be contaminated with UXO, the path to be traveled by the field technician will be searched for hazards by a UXO Technician, using an ordnance locator, ahead of the field technician.

A visual and geophysical search of the proposed route will be conducted for UXO and other hazardous items. If UXO or hazardous items are encountered, they will be marked and identified by position and a clear route around the hazard will be selected.

Standard operating procedures, tailored to the specific requirements for each site may be modified by UXBSS as dictated by site condition and followed by UXB Technicians assigned to the project. For the purposes of escorting single field technicians or small field teams, a single qualified UXO Technician is sufficient provided the UXO Technician has radio communication with the established D&M Command Post. The UXO Technician will not be allowed to perform any intrusive UXO operations, such as excavation or removal of UXO, while working alone. The UXO Technician working alone will only be authorized to locate, flag and avoid suspected hazards to ensure the safety of the field samplers.

2. UXO Team Search and Clearance for Well/Boring Sites - The following steps will be followed to ensure the safety of all personnel involved with drilling wells and borings at sites potentially contaminated with UXO:

a. A search team consisting of two UXO Technicians will conduct a surface visual sweep of the proposed route the drilling rig will take from the road to the drilling site and search a path fifteen feet wide. A circle of sixty feet in diameter centered on the proposed drilling location will also be searched.

b. If UXO is encountered, the team will attempt to find a clear route around the hazardous item. If this cannot be done, because of rough terrain or an abundance of hazardous items in the area, UXO that can be moved remotely will be placed outside of the area to be searched. No UXO will be moved without approval of the UXBSS.

c. If UXO encountered is not safe to be moved, the UXBSS will mark the UXO location, plot the location on a map and contact the D&M PM to receive guidance from the USACE representative for the items final disposition action.

d. Using marking stakes and surveyors tape as necessary, the UXB Technicians will mark the outer perimeter of the proposed searched/cleared safe work area.

e. Two UXB Technicians will then conduct a geophysical search of this area, using a Foerster Ferex Ordnance Locator, to locate metallic items to a minimum depth of three feet. All metallic contacts will be marked with paint, an alternate clear and safe path for the drilling rig will be selected for use.

f. If an alternate path cannot be found, the marked locations will be hand excavated by UXB Technicians to a maximum depth of three feet for the purpose of contact characterization. Buried ordnance will be handled in accordance with (b) and (c) above.

g. During well installation the UXB team will dig the first two feet using a hand auger or post hole digger. The team will perform a down hole search of the point using the Forester Ferex Ordnance Locator assembled in the bore hole mode. This procedure will insure that the well/bore site is clear and void of UXO for the first two feet and the next two subsurface feet. If no significant metallic contacts are encountered the drilling crew will be allowed to set up and begin drilling in increments of two feet. If a significant metallic contact is discovered, the drilling site will be abandoned, moved at least 10 feet, and the above procedure repeated. Each two feet of mechanized drilling will require subsurface scanning to a final depth of 12 feet.

## 2.2 EXCAVATION AND CLEARING EQUIPMENT

The only excavation equipment required for this project are manual hand tools of various types (shovels, spades, post-hole digger and trowels). Brush clearing equipment may be required by manual and mechanized means as required by site conditions and objective.

## 3.0 SEARCH PROCEDURES

UXO search procedures may be modified by the UXOSS as dictated by individual site conditions. UXO search teams will maintain high awareness for signs of possible chemical ordnance. If chemical ordnance or agents are suspected, take no action and withdraw from the area. Notify the USACE Representative for further guidance. All search procedures will be conducted in PPE Level D.

### 3.1 GEOPHYSICAL SEARCH PROCEDURES

a. ESTABLISH THE COMMAND POST - A command post (CP) will always be established whenever field operations are being conducted. The purpose of the CP is to allow a responsible person, who is familiar with on-site operations, to be present and to take appropriate action in case of an emergency at the work site. The person manning the CP will have communications with the field crews and outside assistance (fire dept., ambulance, etc.) at all times. The CP will be a sheltered place, such as a trailer or vehicle, located within the boundaries of the Raritan project.

b. ESTABLISH THE SEARCH AREA - Prior to conducting the geophysical search the boundaries of the area must be established. Field crews will use aerial photos, maps, arsenal records and existing landmarks to locate the desired project site and sampling objective. The UXO team will mark-out site boundaries with wooden stakes. Because the exact sampling locations are not yet determined, the D&M PM will be required to assist the UXBSS in locating the sampling points selected.

c. CONDUCT THE SEARCH - The geophysical search team will consist of two UXB/UXO Technicians. One Technician will carry the Foerster Ferex Ordnance Locator and the other will carry a White's Eagle II Metal Detector. The UXO team will search predetermined lanes and record all contacts on a site map. All positive contacts will be marked with red paint to facilitate relocating the contact for excavation.

#### 3.1.1 VISUAL SURVEY PROCEDURES

a. GENERAL - Unless otherwise specified in this safety supplement or ordnance SOP, visual surveys will be conducted in conjunction with geophysical search.

b. CONDUCT THE SEARCH - The visual search team will consist of two UXB/UXO Technicians.

Some sites may be denuded enabling each individual to visually sweep an area of up to seven feet wide. Sites where vegetation is thick will require limited brush clearing. The team will mark and search access/egress lanes of drilling sites selected and record all UXO and hazards encountered on a site map. All located UXO will be marked with red paint to facilitate relocation and avoidance.

### 3.2 HAND EXCAVATION PROCEDURES

Hand excavation of unknown contacts may occur when avoidance is not practical due to terrain, vegetation or quantity of contacts. Excavation for the purpose of contact characterization may be authorized by the UXBSS on a site-by-site case.

A team of two UXB/UXO Technicians will approach the excavation point with suitable hand tools and the ordnance locator best able to detect the metallic unknown contact to be excavated. Upon arrival at the excavation site, the unknown contact will be reestablished using the ordnance locator. One technician will carefully begin to excavate the soil layers covering and concealing the identity of the contact. The other UXB/UXO Technician will man the ordnance locator and frequently scan the contact to estimate its depth and position below the excavation point. During excavation the UXB/UXO Technician with ordnance locator will withdraw during intrusive excavation a distance of 25 feet upwind and assume a safety observation position. When the object is located, it will carefully be uncovered to reveal identity using standard Explosive Ordnance Reconnaissance (EOR) procedures, a detailed hazard assessment will be performed at this time.

If the object is ordnance it will be flagged and the USACE representative notified. No UXO will be moved without approval of the UXBSS. Upon identification of a non-UXO item (scrap metal, cans, wire, bolts) the item will be removed, and disposed of off site in an approved refuse container. The excavation site will then be backfilled, using hand tools.

### 3.3 EXPLOSIVE ORDNANCE RECONNAISSANCE (EOR) PROCEDURE:

UXO/EOR tasks include, but are not limited to the following:

Investigate - The investigation of suspect sites is performed to confirm or eliminate the UXO suspect assessment.

Diagnose - The UXB Technician will determine the approximate location, size and type of UXO through visual and geophysical investigation techniques.

Locate - If a UXO is not visible on the surface but evidence suggests a subsurface possibility, the UXB Technician is to determine through electronic subsurface search the approximate location, calculated depth, and position of the item.

Mark - The UXB Technician must clearly mark each UXO and or suspect item as soon as safely possible. Marking is extremely important. Markers must be plainly visible and easily recognized by all site personnel and team members.

Report - If possible, an accounting of recoverable information pertaining to: nomenclature, fuzing, explosive filler, measurements, painting and markings, hazard assessment, location, and specific recommended ordnance safeties relating to approach are to be documented. Movement of UXO is not authorized by one individual UXB Technician.

Protect - The UXB Technician must initiate and supervise protective measures which are essential for the protection of life and property. The EOR assessment is to determine if total or partial evacuation of a work area is required or if a modification to procedures should be required to continue scheduled operations.

#### 4.0 RESUMES and CERTIFICATES . . .

Resumes and Certificates of UXB personnel are attached on the following pages.

#### 5.0 APPENDIX - A

Appendix - A--Provides information on safety concepts and basic considerations relating to Unexploded Ordnance in general. These safety concepts and considerations are not specific to a site or proposed operation on the Arsenal. The intent of this Appendix is to provide general guidance and additional information for UXB field teams should a need arise.

SECTION FOUR

UXB PERSONNEL RESUMES and CERTIFICATES



DAVID R. DYESS  
EXPLOSIVE ORDNANCE DISPOSAL TECHNICIAN  
SAFETY OFFICER

EDUCATION: Graduate, U.S. Naval School of Explosive Ordnance Disposal, 1972  
Graduate, OSHA 40 Hour Health and Safety Course (29 CFR 1910.120)

EMPLOYMENT HISTORY:

October 1989 - Present, UXB International, Inc.  
August 1969 - August 1989, U.S. Air Force

PROFESSIONAL EXPERIENCE:

October 1989 - Present  
UXB International Inc.  
14800 Conference Center Dr., Suite 100  
Chantilly, Va. 22021

Explosive Ordnance Disposal Technician conducting ordnance location, identification and disposal operations at NAS Brunswick, Me., Crab Orchard Army Ammunition Plant, Il., and Tooele and Dugway Proving Grounds, Ut.. Site Supervisor during toxic chemical agent monitoring and UXO location operations accomplished in Level "A" Personal Protective Equipment at the "G" Street Salvage Yard Remediation, Aberdeen Proving Ground, Md., Edgewood Area.

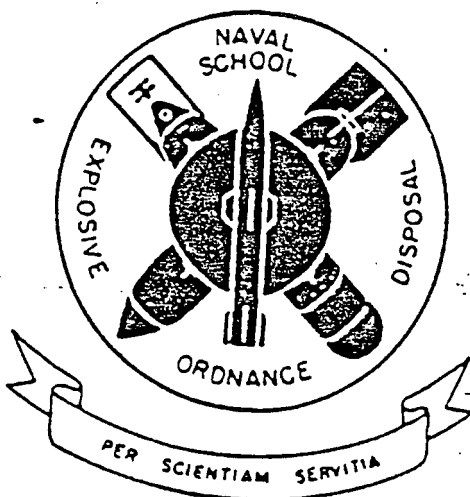
August 1969 - August 1989  
U.S. Air Force  
Various Commands

Explosive Ordnance Disposal Technician, Range Safety Officer, and EOD Instructor at various commands. Conducted range clearance and ordnance disposal operations Thailand and Lakeside Range Ut., provided EOD support during eleven aircraft crash cleanups, and served as Senior Instructor for rockets and projectiles at the U.S. Naval School of EOD.

ADDITIONAL INFORMATION:

Mr. Dyess is currently an employee of UXB International, Inc. He is a Master Rated EOD Technician with over eighteen years of operational EOD experience.

# Naval School Explosive Ordnance Disposal



This certifies that

SERGEANT DAVID E. DYESS, FRODO-1-7071, USAF

having successfully completed the prescribed course of study  
for Explosive Ordnance Disposal course

is awarded this

Certificate

this 28th day of APRIL A.D. 1972



*D. H. Moody*

D. H. MOODY, CPT, USAF

COMMANDING OFFICER

# *Certificate of Training*

**UXB International, Incorporated**

*proudly presents this award for  
educational achievement to*

**David Dyess**

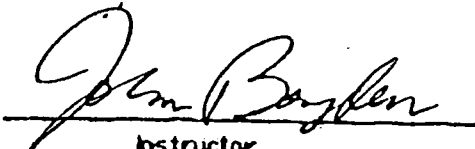
*for satisfactorily completing the course of*

**8 Hour Refresher Health and Safety Training for**

**Hazardous Waste Operations**

**14 December, 1990**

**U X B**  
INTERNATIONAL

  
Instructor

14800 Conference Center Drive, Suite 100, Chantilly, VA 22021-3806 (703)803-8904

WASHINGTON OCCUPATIONAL HEALTH ASSOCIATES, INC.

Suite 410  
1120 19th Street, N.W.  
Washington, D.C. 20036  
(202) 463-6698

MEDICAL MONITORING EXAMINATION  
EMPLOYER NOTIFICATION

Employee DYESS, DAVID

Date 9-21-90

Employer UNEXPLODED BOMBS INTERNATIONAL

I have reviewed the results of this employee's medical monitoring examination and certify that the record (☒ is/☐ is not) complete. (Tests not performed: \_\_\_\_\_)

Please check all sections that are applicable to this examination:

Applicable Not  
Applicable



☒ Asbestos Certification — Opinion of Increased Risk:

This individual was examined as per OSHA Standards (29 CFR 1910.1001 and 29 CFR 1926.58. In my opinion, (☐ there is/☐ there is no) medical condition that places the individual at increased risk from exposure to asbestos, tremolite, anthophyllite, or actinolite.



☐ Respirator Certification:

This individual has been examined as per OSHA Standards (29 CFR 1910.134) and found (☒ qualified/☐ not qualified) to use a respirator.



☒ Respirator Fit Testing:

This individual has been examined as per OSHA Standards (29 CFR 1910.134) and has (☐ passed/☐ not passed) a qualitative fit test.



☐ Hazardous Waste Certification:

This individual has been examined as per OSHA Standards (29 CFR 1910.120). In my opinion, this individual is:

- ☒ qualified for full participation in hazardous waste site work when conducted under the conditions of adequate training and a health and safety plan.
- ☐ qualified with limitations that restrict full participation in hazardous waste site work as described below.
- ☐ not qualified for any direct work with hazardous waste or hazardous waste sites as described below.

Comments: (Please describe any work limitations including functional and environmental limitations, whether temporary or permanent, pending medical evaluation, etc.)

I have informed the employee about medical conditions discovered during my examination that require further examination or treatment.

Physician Name: (Print) RONALD FINE

(Signature) Ronald Fine

Date 10/6/90

WHITE - EMPLOYEE  
YELLOW - PHYSICIAN  
PINK - EMPLOYEE

DANIEL E. STEPHENS  
UNEXPLODED ORDNANCE TECHNICIAN

EDUCATION: Graduate, U.S. Naval School of Explosive Ordnance Disposal, 1983  
Graduate, 40 Hour OSHA Health and Safety Training (29 CFR 1910.120)

EMPLOYMENT HISTORY:

December 1988 - Present, UXB International, Inc.  
March 1983 - March 1988, U.S. Air Force

PROFESSIONAL EXPERIENCE:

December 1988 - Present  
UXB International, Inc.  
14800 Conference Center Dr., Suite 100  
Chantilly, Va. 20021

Site Supervisor and Safety Officer responsible for managing the safe location, identification, and disposal of UXO during the surface and subsurface UXO survey and clearance at the following major sites:

- Slesse Demolition Range, Chilliwack, Canada. Supervised the UXO clearance of this 17 acre live-fire range.
- Sarcee Gunnery Range, Calgary, Canada. Supervised the UXO clearance of this 1000 acre live-fire artillery range.
- Meaford Artillery Range, Ontario, Canada. Supervised the UXO clearance of this 1260 acre live-fire artillery range.

UXO Technician performing UXO location, identification, and removal operations at the former Sioux Ammunition Aepot, Sidney, Ne.

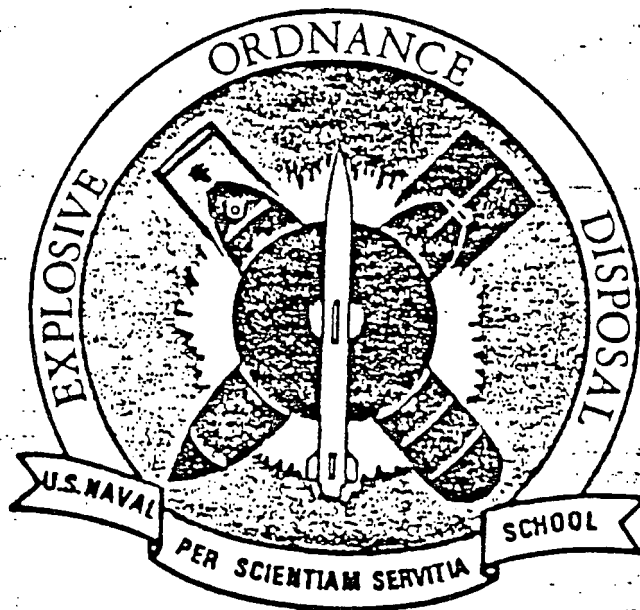
March 1983 - March 1988  
U.S. Air Force  
Various Commands

Explosive Ordnance Disposal Technician and Sweep Team Leader for bombing range UXO location, identification, and disposal operations. Also provided EOD response to ordnance and explosives accidents.

ADDITIONAL INFORMATION:

Mr. Stephens is currently an employee of UXB International, Inc. He is a Senior Rated EOD Technician with over seven years of operational EOD experience.

# Naval School Explosive Ordnance Disposal



This certifies that

Airman First Class  
Daniel E. Stephens, 268-60-9946, USAF

having successfully completed  
the prescribed course of study for

EXPLOSIVE ORDNANCE DISPOSAL SPECIALIST - G5ABN46430  
PDS-CID

is awarded this  
Certificate

this 1st day of

March

1983

James C. Blanton  
JAMES C. BLANTON, CDR, USN  
COMMANDING OFFICER

# *Certificate of Training*

**UXB International, Incorporated**

*proudly presents this award for  
educational achievement to*

**Dan Stevens**

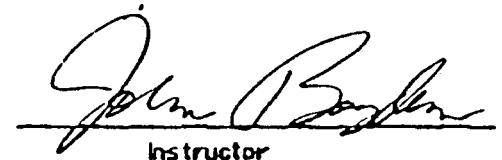
*for satisfactorily completing the course of*

**8 Hour Refresher Health and Safety Training for**

**Hazardous Waste Operations**

**14 December, 1990**

**U X B**  
INTERNATIONAL

  
Instructor

WASHINGTON OCCUPATIONAL HEALTH ASSOCIATES, INC.

Suite 410  
1120 19th Street, N.W.  
Washington, D.C. 20036  
(202) 463-6698

MEDICAL MONITORING EXAMINATION  
EMPLOYER NOTIFICATION

Employee STEPHENS, DANIEL Date 10-25-90

Employer UNEXPLODED BOMBS INTERNATIONAL

I have reviewed the results of this employee's medical monitoring examination and certify that the record (☒ is/☐ is not) complete. (Tests not performed: \_\_\_\_\_)  
(\_\_\_\_\_)

Please check all sections that are applicable to this examination:

Applicable ☐ Not Applicable ☒

☒ Asbestos Certification — Opinion of Increased Risk:

This individual was examined as per OSHA Standards (29 CFR 1910.1001 and 29 CFR 1926.58. In my opinion, (☐ there is/☐ there is no) medical condition that places the individual at increased risk from exposure to asbestos, tremolite, anthophyllite, or actinolite.

☒ Respirator Certification:

This individual has been examined as per OSHA Standards (29 CFR 1910.134) and found (☒ qualified/☐ not qualified) to use a respirator.

☒ Respirator Fit Testing:

This individual has been examined as per OSHA Standards (29 CFR 1910.134) and has (☐ passed/☐ not passed) a qualitative fit test.

☒ Hazardous Waste Certification:

This individual has been examined as per OSHA Standards (29 CFR 1910.120). In my opinion, this individual is:

- ☒ qualified for full participation in hazardous waste site work when conducted under the conditions of adequate training and a health and safety plan.
- ☐ qualified with limitations that restrict full participation in hazardous waste site work as described below.
- ☐ not qualified for any direct work with hazardous waste or hazardous waste sites as described below.

Comments: (Please describe any work limitations including functional and environmental limitations, whether temporary or permanent, pending medical evaluation, etc.)  
\_\_\_\_\_  
\_\_\_\_\_

I have informed the employee about medical conditions discovered during my examination that require further examination or treatment.

Physician Name: (Print) Dunn (Signature) [Signature]  
Date 11/7/90

WHITE - EMPLOYEE  
YELLOW - PHYSICIAN  
PINK - EMPLOYEE



BRUCE M. MOE  
UXO Technician  
UXB INTERNATIONAL

EDUCATION: Graduate, U.S. Naval School of Explosive Ordnance Disposal, 1984  
Graduate, OSHA 40 Hour Health and Safety Training (29 CFR 1910.120)  
High School Graduate

EMPLOYMENT HISTORY:

April 1987 - Present, UXB International, Inc.  
September 1982 - May 1986, U.S. Navy

PROFESSIONAL EXPERIENCE:

April 1987 - Present  
UXB International, Inc.  
14800 Conference Center Dr.  
Suite 100  
Chantilly, Va. 22021

Explosive Ordnance Disposal Technician and Quality Assurance Manager for the Bombing Range Maintenance Project, NAS Fallon, Nv. Directs sweep teams in the location, identification, collection, inert certification and removal of ordnance debris. Accompanies and assists government quality assurance inspectors during range clearance certifications. Directed 30 Ordnance Workers while conducting a 3,800 acre surface sweep and subsurface survey of the Sarcee, Canada Artillery Range. UXO Site Supervisor directing and coordinating UXO location, identification and disposal operations at Umatilla Army Depot Activity, Or., Savanna Army Depot Activity, Il., and Tooele and Dugway Proving Grounds, Ut.

September 1982 - May 1986  
U.S. Navy, EOD Mobile Unit One  
Barbers Point, Hawaii

Explosive Ordnance Disposal Technician and member of a 4 man EOD detachment. Conducted frequent ordnance clearance operations on the Kahoolawe Island, HI. Bombing Range. Duties included conducting land surveys of the naval target range, identification and hazard assessment of a wide variety of ordnance, and disposal of UXOs by detonation. Also responded to ordnance and explosives related emergencies throughout the Pacific region.

SEP 08 1982 OG 9770

32DEC14 0000

34OCT01 0000

0000

5332

ELON  
RHS  
RHS  
LJS

3 RECORD OF NAVY SERVICE SCHOOLS ATTENDED (CLASS R, A, C, F, P, V AND F)

COURSE TITLE AND SCHOOL LOCATION:  
HULL MAINTENANCE TECHNICIAN "HTA" SCHOOL  
NDCTC, PHILADELPHIA, PA 19112

EARNED NEC: NA  
COURSE LENGTH: 10 WEEKS  
DATE ENROLLED: 82SEP01

DATE COMPLETED: 82DEC14  
FINAL MARK:   
CLASS STANDING:   
in a class of:   
MANNER OF COMPLETION:   
☒ GRADUATED ☐ DROPPED FOR

SIGNATURE: R.H. Still  
COURSE TITLE AND SCHOOL LOCATION:  
EOD COURSE  
REDSTONE ARSENAL, AL

EARNED NEC: 0000  
COURSE LENGTH: 5.0  
DATE ENROLLED: 14 FEB 1983

DATE COMPLETED: 83MAR24  
FINAL MARK: SAT  
CLASS STANDING: N/A  
in a class of:   
MANNER OF COMPLETION:   
☐ GRADUATED ☐ DROPPED FOR

SIGNATURE: P.P. Martin  
COURSE TITLE AND SCHOOL LOCATION:  
PERSONNEL TRAINING

COURSE TITLE AND SCHOOL LOCATION:  
SECOND CLASS (A-433-0022) NAVY DIVING  
AND SAVAGE TRNG CENTER PANAMA CITY FL

EARNED NEC: 5343  
COURSE LENGTH: 12 WKS  
DATE ENROLLED: 08 APR 83

DATE COMPLETED: 01JUL83  
FINAL MARK: SAT  
CLASS STANDING:   
in a class of:   
MANNER OF COMPLETION:   
☒ GRADUATED ☐ DROPPED FOR

SIGNATURE: A.B. Farkonovich Jr.  
COURSE TITLE AND SCHOOL LOCATION:  
NAVY EXPLOSIVE ORDNANCE DISPOSAL  
BASIC A-431-0011, INDIAN HEAD, MD

EARNED NEC: 5332  
COURSE LENGTH: 7 WKS  
DATE ENROLLED: 05 APR 83

DATE COMPLETED: 05 APR 83  
FINAL MARK: SAT  
CLASS STANDING:   
in a class of:   
MANNER OF COMPLETION:   
☒ GRADUATED ☐ DROPPED FOR

SIGNATURE: J.M. Banks  
COURSE TITLE AND SCHOOL LOCATION:  
NAVY EXPLOSIVE ORDNANCE DISPOSAL  
BASIC A-431-0011, INDIAN HEAD, MD

4. TRAINING COURSES COMPLETED

DESCRIPTION OF COURSE, RATE OR NAVPERS NUMBER	DATE COMPLETED	OFF INIT	DESCRIPTION OF COURSE, RATE OR NAVPERS NUMBER	DATE COMPLETED	OFF INIT
BMR 3.36	27OCT82	AMB			
FIREMAN 3.76	27OCT82	AMB			
MRPO 362 (3.6)	27OCT82	AMB			
NAVSTRA 10056 61 158884	29JAN85	AMB			
HT 382, 3.5					

5. EDUCATIONAL  
EXPERIENCE LEVEL

GED (HS) EQUIVALENT TEST:

DATE PASSED:   
OFF INITIALS:   
STATE THAT ISSUED DIPLOMA OR  
CERTIFICATE:   
COLLEGE LEVEL GENERAL EXAMS:

DATE PASSED:   
OFF INITIALS:   
PRESENT LEVEL OF EDUCATION:

12 13 14 15 16 17

NAME (Last, First, Middle):  
MIL GRULL MICHAEL

COMPANY NUMBER

0161

SOCIAL SECURITY NO

547-64-0251

GRADE AND CLASS

USN

# Certificate of Training

UXB International, Incorporated

*proudly presents this award for  
educational achievement to*

To: Mr. Bruce Moe

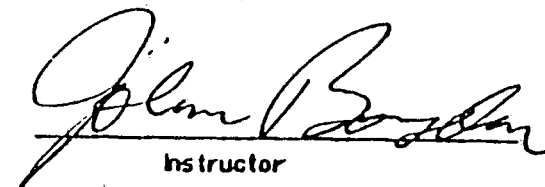
*for satisfactorily completing the course of*

8 Hour Refresher Health and Safety Training for

Hazardous Waste Operations

17 October 1990

**U X B**  
INTERNATIONAL

  
Instructor

14800 Conference Center Drive, Suite 100, Chantilly, VA 22021-3806 (703)803-8904

EXHIBIT 3-3  
PHYSICIAN STATEMENT

FOR EMPLOYEE OR APPLICANT OF 4XB

PARTICIPANT NAME: Mr. Bruce DATE OF EXAM 21 June 90  
TYPE OF EXAM (preassignment, annual or other):  
PARTICIPANT DATE OF BIRTH: 6-17-59  
PARTICIPANT SOCIAL SECURITY NUMBER: 397-64-0251  
The individual named above has:

1. undergone a physical examination and been found medically  
( ☒ ) qualified for hazardous waste site work  
( ) not qualified for hazardous waste site work  
and
2. undergone a physical examination as per OSHA (29 CFR 1910.134 (b) (10) and been found medically  
( ☒ ) qualified to use a respirator  
( ) not qualified to use a respirator

Physician Signature [Signature]

OSHA 1910.134 (b) (10) States that persons should not be assigned to tasks requiring use of respirators unless it has been determined that they are physically able to perform the work and use the equipment. The local physician shall determine what health and physical conditions are pertinent.

If it is the opinion of the examining physician that an examinee is unqualified to perform hazardous waste site work of to wear a respirator the physician should append a further report to this statement which details reasons for the opinion.

PHYSICIAN'S STATEMENT

Family Health Clinic

June 21, 1990

RE: BRUCE MOE

To Whom It May Concern:

Mr. Bruce Moe was in to see me for an exam on 6/22/89. He is qualified for hazardous waste work and also qualified to use a respirator.

If you have any further questions, please feel free to contact me.

Sincerely,

[Signature]  
Dave McNamara, M.D.

SECTION FIVE

APPENDIX - A

Rev 11 Jan 91

U.S. ARMY CORPS OF ENGINEERS, HUNTSVILLE DIVISION

SAFETY CONCEPTS AND BASIC CONSIDERATIONS

UNEXPLODED EXPLOSIVE ORDNANCE (UXO)

There is no "safe" procedure for dealing with UXO, merely procedures which are considered least dangerous. However, maximum safety in any UXO operation can be achieved through adherence to applicable safety precautions and a preplanned approach. Plans shall be based upon the minimum possible exposure, consistent with efficient operations and maximum safety. All personnel engaged in UXO operations shall be thoroughly trained in explosive safety and be capable of recognizing hazardous explosive exposures. Safety must become a firmly established habit when working with UXO.

I. Care must be observed in probing for, moving, and handling UXO. Operations on the UXO should be conducted only after the establishment of a complete plan for the operation involved and careful preparation to insure its implementation.

II. As a general rule, UXO will be detonated in place when the situation allows. All detonation-in-place shall be conducted by electrical means to assure maximum control of the site. No UXO shall be destroyed until it has been positively identified.

A. Make every effort to identify the UXO. Carefully examine the item for markings and other identifying features such as shape, size, and external fittings. However, do not move the item to inspect it. If an unknown UXO is encountered, photographs shall be taken and express-mailed to CEHND-ED-SY, which has access to the TM 60-Series publications.

3. Foreign UXO were returned to the United States for exploitation and disposal. Records search should indicate the possibility of foreign UXO being on the site.

C. If the records search indicates UXO containing military toxic chemical agents may be on the site, a decontamination plan shall be approved prior to entry onto the site.

(1) Any time a suspected chemical UXO is encountered, the 2-man concept is immediately implemented and notification shall be made through proper channels. The UXO shall be secured until the military arrives and assumes ownership.

D. If the situation dictates, protective measures to reduce shock, blast, and fragmentation damage shall be taken. Army Technical Manual (TM) 5-355-1, Fundamentals of Protective Design for Conventional Weapons and associated software program "CONVEP" contains data on blast effects, ground shock, cratering, ejecta, and fragmentation.

(1) For non-fragmenting explosive materials, evacuation distance should be a minimum of 1250 feet.

(2) For fragmenting explosive materials, evacuation distance should be a minimum of 2500 feet. For bombs and projectiles with caliber 5-inch or greater, use a minimum evacuation distance of 4000 feet.

(3) Items with lugs and/or strongbacks and nose and/or tail plate sections should be oriented away from personnel locations.

E. Consideration shall be given to tamping the UXO to control fragments, if the situation warrants. Fragments shall be minimized not only to protect personnel but property such as buildings, trees, etc.

F. Do not allow one person to work alone in disposal operations. At least one person shall be available near the disposal site to give warning and assist in rescue activities in the event of an accident.

(1) Plan for, provide, and know the measures to be taken in the event of an accident.

(2) Provide a designated emergency vehicle in the area in case of an accident or other emergency.

G. Coordination with the appropriate airspace representative shall be conducted and the appropriate notification procedures arranged.

H. A post-search of the detonation site shall be conducted to assure a complete disposal was accomplished.

I. Open burning of explosives and smokeless powder or chemical decomposition of explosives shall not be accomplished without prior approval of the contracting officer.

(1) If loose explosives are to be disposed of by detonation, detonate only one kind of explosive in any one given shot.

(2) Exercise extreme care in handling and preparing high explosives for detonation. They are sensitive to detonation by heat, shock, and friction.

(3) Keep initiating explosives in a water-wet condition at all times until ready for final preparation for detonation. The sensitivity of these explosives is greatly increased when dry.

(4) When disposing of high explosives by detonation, do not approach the disposal site for at least 30 minutes in the event of a misfire.

III. UXO which penetrates the earth to a depth where the force of the explosion is not enough to rupture the earth's surface forms an underground cavity



called a camouflet. Camouflets will be filled with the end product of the explosion, carbon monoxide gas. Camouflet detection and precautions must be considered if records search indicates the site was used as an impact area.

IV. Avoid inhalation of, and skin contact with smoke, fumes, and vapors of explosives and related hazardous materials.

V. Consider UXO which has been exposed to fire as extremely hazardous.

Chemical and physical changes may have occurred to the contents which render it much more sensitive than it was in its original state.

VI. Do not depress plungers, turn vanes, or rotate spindles, levers, setting rings, or other external fittings on the UXO. Such action may arm, actuate, or function the UXO.

A. DO NOT dismantle, strip, or subject any UXO to unnecessary movement, except in response to a valid requirement.

B. Before any movement of an UXO, the fuze condition must be ascertained. If the condition is questionable, consider the fuze armed. The fuze is considered the most hazardous component of UXO, regardless of type or condition.

(1) In general, the condition of a BD fuze in an unexploded projectile cannot be determined through examination of its external features. When there is evidence that the projectile has been fired, the BD fuze is considered to be in the armed condition.

(2) Arming wires and popout pins on unarmed fuzes should be secured by taping in place prior to movement.

C. Perform any initial movement of an armed fuze remotely and avoid any unnecessary movement of an armed fuze.

- D. When transporting a possible armed fuze, position the fuze in the most neutral orientation possible.
- E. Do not subject a mechanical time fuze to any unnecessary movement.
- F. Do not unscrew a fuze from a fuze well that does not contain a fuze cavity liner. High explosives may be on the threads.
- VII. Do not allow unauthorized or unnecessary personnel to be present in the vicinity of UXO. Limit personnel exposure time. Operations shall always be based upon minimum exposure consistent with efficient operations.
- VIII. Do not rely on the color coding of UXO for positive identification of contents. Munitions having none, incomplete, or improper color coding have been encountered.
- IX. Avoid the area forward of the nose of a munition until it can be determined that the item is not a shaped charge and High Explosive Anti-tank (HEAT) UXO. The explosive jet can be fatal to great distances forward of the longitudinal axis of the item.
- A. Assume any shaped charge munition to contain a piezoelectric (PZ) fuzing system until the fuzing is otherwise identified. A PZ fuze is extremely sensitive, can fire at the slightest physical change, and may remain hazardous for an indefinite period of time.
- X. Examine a projectile for the presence or absence of an unfired tracer.
- XI. Perform initial movement of an embedded projectile remotely. First movement of an embedded projectile may cause fuze functioning. During this remote operation, precautions shall be taken for a high-order detonation.
- XII. Do not inhale the smoke or fumes of burning pyrotechnic or incendiary materials. The fumes and dust from many of these materials are irritating and/or toxic if inhaled.

A. Use sand to smother incendiary fires. Water may induce a violent reaction or be completely ineffective, depending on the mixture.

B. Bury incendiary-loaded munitions in sand when transporting them. This will smother any fire which should start until other corrective action can be taken.

C. Anticipate a high-order detonation when burning pyrotechnics or incendiary-loaded UXO. Safety measures for personnel and property must be based on this possibility.

D. Expanded pyrotechnic/practice devices may contain red/white phosphorus residue. Due to incomplete combustion, red and white phosphorus may be present and reignite spontaneously if subjected to friction or if the crust is broken.

E. Do not approach a smoking white phosphorus (WP) UXO. Burning WP may detonate the burster or dispersal explosive charge at any time.

F. Do not transport a WP munition, unless it is immersed in water, mud or wet sand.

G. Extra care shall be taken when uncovering a buried UXO, if records search indicated WP munitions were fired or destroyed in the area. A buried WP munition may be damaged and when exposed to air may start burning and detonate. An ample supply of water and mud shall be immediately available if excavation reveals a WP UXO. Appropriate protective equipment (leather gloves, face shield, and flame-retardant clothing) and first aid shall also be immediately available.

H. WP UXO shall not be detonated into the ground. The UXO shall be counter-charged on the bottom-center-line.

2. Photoflash powder will react with moisture and generate hydrogen gas, and this reaction may generate sufficient heat or pressure to detonate the UXO. Do not look directly at photoflash UXO during detonation.

3. If loose pyrotechnic, tracer, flare, and similar mixtures are to be transported, they shall be placed in #10 mineral motor oil or equivalent to minimize fire and explosion hazard.

XIII. Assume a practice UXO contains a live charge until it can be determined otherwise.

A. Inert UXO will not be disposed of or sold for scrap until the internal fillers have been exposed and unconfined. Heat generated during a reclamation operation can cause the inert filler, moisture and air to expand and burst sealed casings. Venting or exposure may be accomplished in any way necessary to preclude rupture due to confined pressure.

XIV. Approach an unfired rocket motor from the side. Ignition will create a missile hazard and hot exhaust.

A. Do not expose electrically fired rocket motors within 25-feet of any exposed electronic transmitting equipment or exposed antenna leads.

B. If an unfired rocket motor must be transported, it shall be positioned in the direction which offers the least exposure to personnel in the event of an accident ignition.

XV. Consider an emplaced landmine armed until proven otherwise. It may not be possible to tell, or it may be intentionally rigged to deceive.

A. Many training mines contain firing indicator charges capable of inflicting serious injury.

3. Exercise care with wooden mines that have been buried for a long time. Because of soil conditions, the wood deteriorates and the slightest inadvertent pressure on top may initiate the fuze.

XVI. Do not pack a bomb fuze well with explosives unless it can be positively confirmed that the fuze well does not contain any fuze components.

A. Photoflash bombs must be handled with the same care as black powder, and with even greater care than explosive-loaded bombs.

3. Some practice bombs do not contain any positive safety features. Positively identify and review all safety precautions prior to handling practice bombs.

XVII. The usual method for uncovering buried UXO is to excavate by hand. Hand excavation is the most reliable method for uncovering UXO, but unless the UXO is very near the surface, hand excavation exposes more people to the hazard of detonation for a longer period of time than any other method.

A. Earth moving machinery (EMM) may be used to excavate for buried UXO, if the UXO is estimated to be deeper than 12 inches. EMM shall not be used to excavate within 12 inches of an UXO. When excavation gets within 12 inches of an UXO, hand excavation shall be used to uncover the UXO.

(1) If more than one EMM will be used on the same site, they will be separated by at least 100m during excavation.

B. Excavation shall comply with the provisions of 29 CFR 1926 subpart P.

XVIII. The site shall be surveyed for electromagnetic radiation (EMR) radio frequency (RF) transmitters and appropriate action taken. Safe distances have been established for specific transmitter power and transmitters. These distances shall be made available to the contractor by CENHD-ED-SY, upon request.

circumstances should an attempt be made to drill a hole in a projectile, either through the fuse or the body of the projectile.

XXI. If base-ejection type projectiles must be transported to a disposal area or collection point, the base shall be oriented to the rear of the vehicle and the projectile secured, in the event the ejection charge functions in route.

XXII. If an OEW, with exposed hazardous filler (HE, etc), has to be moved to a disposal area, the item shall be placed in a heavy duty plastic bag to prevent migration of the hazardous filler. Padding should also be added to protect the exposed filler from heat, shock, and friction.

XXIII. Do not undertake the handling or disposal of liquid propellant fuels or oxidizers if not familiar with the characteristics of the material.

XXIV. 29 CFR 1925.100(a) requires personnel to wear protective helmets in areas where there is a possible danger of head injury from impact, or from falling or flying objects, or from electrical shock or burns. During field activities on ordnance projects, hardhats need not be worn unless a head injury threat is present.

XXV. Soil samples, test pit excavation, and/or monitoring well installation are sometimes conducted in areas where subsurface UXO may be found. These intrusive activities must be preceded by a magnetometer survey to assure the safety of the sampling crews.

A. Prior to the drilling rig coming on site, a magnetometer and a hand-held auger shall be utilized to assure the drilling spot is clear of subsurface UXO.

(1) After finding an area the magnetometer indicates is clear of detectable UXO, the hand-held auger should be used to start the drill hole. At not more than 2-foot depth, the hand-held auger shall be withdrawn and the

magnetometer probe shall be lowered into the auger hole. This procedure will ensure small UXO items (20mm projectiles and grenades), undetectable from the surface, are now detectable. This procedure shall be repeated until the maximum depth of the hand-held auger.

(2) Borehole monitoring shall continue at 2-foot intervals until virgin soil is encountered.

XXVI. The detection and identification of suspect explosive materials shall be accomplished IAW Chapter 13, TM 9-1300-214, "Military Explosives".

## ELECTROMAGNETIC RADIATION (EMR) HAZARDS

### UNEXPLODED EXPLOSIVE ORDNANCE (UXO)

The use of electroexplosive devices (EED) susceptible to EMR devices in the radio frequency (RF) range, that is, radio, radar, and television transmitters, has become almost universal. Radio frequency electromagnetic radiation consists of waves of electrical energy at radio transmission frequencies. These waves are radiated in a line-of-sight from the antennas of electronic devices that transmit radio, radar, television, or other communication or navigation radio frequency signals. The energy is usually equally radiated in all directions; however, certain types of antennas focus the energy, transmitting it in a single direction or sector only. EMR (RF) can also be reflected from large metallic surfaces or objects into areas not directly reached by the line-of-sight-radiated electric energy.

Under highly undesirable conditions, enough of the energy may be picked up by portions of the EED\*, associated circuitry, or related objects acting as receiving antennas, to initiate the EED.

\* (An EED is used to ignite a limited quantity of explosive, propellant, or pyrotechnic material contained in the device. The actuation of the EED is produced by the application of electrical energy from an outside source across an internal conductor or spark gap. An EED is generally a subassembly used to trigger a larger assembly.) [EED's have extensive military applications. They are used to activate certain control devices, to arm many various



ordnance items, and to initiate explosive trains. Examples are artillery/mortar proximity (variable time (VT)) fuzes, rocket motors, and electric blasting caps.)

Since the strength of the radiation decreases as the distance from the transmitter increases, the further away the ordnance item is, the less hazardous the situation. The energy can pass directly through materials that do not conduct electricity, such as wood or plastic. Therefore, using these materials as a barrier is of little value. The factors to be considered when evaluating the degree of hazard that the EMR (RF) energy represents are: (1) the strength of the field, that is, its power; (2) the nature of the frequencies transmitted; (3) the distance from the transmitter antenna to the ordnance, and; (4) the amount or type of protection available.

#### Hazards of Electromagnetic Radiation to Ordnance (HERO).

Some ordnance is particularly susceptible to EMR (RF) emission. This susceptibility is usually caused by the design of the ordnance item or the type of EED that is used. HERO categories have been established under which ordnance is classified as safe, susceptible, and unsafe. A knowledge of ordnance that is normally unsafe in the presence of EMR (RF) is important so that preventive steps can be taken if the ordnance is encountered in a suspected EMR (RF) field.

In general, all ordnance items, even those normally safe when intact, are hazardous when extensively damaged. The damage may expose components,

stranding wires, or breaks in shielding integrity that permit the entrance of EMR (RF) energy into the ordnance item and then into the EED.

The presence of antennas, communication and radar devices should be a point of interest on initial site visits and preliminary assessments.

**ATTACHMENT B**

**AREA DESCRIPTION AND ACTIVITY TABLES**

**DAMES & MOORE - AREA 2**

<b>ACTIVITY</b>	<b>PARAMETER</b>	<b>REASON</b>
UXO Survey	Subsurface Ordnance	A UXO search will be conducted to clear the area prior to any invasive activities. If anomalies are detected, no drilling will be performed in the suspect area.
Soil Borings/Sampling Approximately 40 borings Sampling depths: 0-12", 2-3', 4-5'  Locations will be based on the soil gas survey, physical irregularities (up to 20 boreholes) and a grid system (up to 20 boreholes)	VOCs, Metals, Explosives	Metals and VOCs were detected in soil samples collected by OBG. This activity will help determine the horizontal and vertical extent of the contamination.
Soil Gas Survey	VOCs	A soil gas survey will be conducted in an effort to define VOC contamination in the soils, and to locate the monitoring wells.
Monitoring Well Installation and Ground Water Sampling - 1 new upgradient well (shallow) - 1 new downgradient well (deep) - Sample new and four existing wells - 1 upgradient existing well - 3 downgradient existing wells	VOCs, Semivolatiles, Metals, Explosives, Pesticides	To confirm and help determine extent of VOC contamination identified by OBG in MW-13, and to assess general ground water quality impact from Areas 2 and 3.

OBG - AREA 3	
INVESTIGATION	RESULTS
UXO Search & Removal	Igniters, fuses, and small projectiles removed
Geophysical Surveys - Magnetometer - GPR	Evidence of subsurface anomalies
7 Surficial/Soil Samples: (SS3-1 through SS3-7)	- VOCs detected below action levels - Metals detected: (Lead 235 ppm - SS3-3) - Explosives: (2,4,6-TNT 7.28 ppm)
8 Soil Borings/Sampling: (B-12 through B-18) 3 Samples from each boring: 0-5', 5-10', 10-15'	- VOCs detected below action levels - Metals detected (Lead 188 ppm) - Explosives - ND
3 Monitoring Wells/Ground Water Samples MW-13 through MW-15 (also described in Area 2)	VOCs detected: (Trans-1,2-DCE-18 ppb; TCE-43 ppb) - Metals detected below MCLs - TRPH - (6 ppm) - Explosives - ND

### DAMES & MOORE - AREA 3

ACTIVITY	PARAMETER	REASON
UXO Survey	Subsurface Ordnance	A UXO search will be conducted to clear the area prior to any invasive activities. If anomalies are detected, no drilling will be performed in the suspect area.
Soil Boring/Sampling - grid (100-foot interval); east of Raritan Center Parkway; approximately 12 borings Sampling depths: 0-12", 2-3', 4-5'	VOCs, Metals, Explosives	Metal and explosive contamination was detected in OBG soil samples from this area. This activity will help determine the horizontal and vertical extent of the soil contamination.
- Grid (40-foot interval); Fenced area; approximately 10 borings Sampling depths; 0-12", 2-3', 4-5'	Metals Explosives	Metals and explosives were detected in OBG soil samples from this area. This activity will help determine the horizontal and vertical extent of this potential contamination.
- Centered at 100-foot intervals along grass strip by MW-15; approximately 4 borings Sampling depths: 0-12", 2-3', 4-5'	VOCs, Metals, Explosives	This activity will help assess potential contamination in this part of Area 3. This strip of property has not been extensively developed.
Surface Water and Sediment Sampling - Area 3, south of Raritan Center Pkwy, and northeast of Clover Place - 1 each, surface water and sediment	Metals Explosives VOCs Semivolatiles Pesticides	To help assess general quality of surface water and sediments at this location.

OBG - AREA 4	
INVESTIGATION	RESULTS
<b>UXO Survey &amp; Removal</b> - spot checks - along geophysical survey lines	Scattered bulk high explosives, ordnance fragments, and one 9-inch diameter projectile
<b>Geophysical surveys</b> - Magnetometer - GPR	No indication of buried objects in surveyed areas
<b>Surficial Soil</b> - 8 shallow soil samples: (SS4-1 through SS4-8)	- VOCs - ND - Metals (Lead - 3,150 ppm) - Explosives (2,4,6-TNT-120,000 ppm)
<b>4 Soil Borings: (B-19 through B-22)</b> - from 3 intervals of 0-5', 5-10', 10-15'	- VOCs - ND - Metals detected (lead 303 ppm) - Explosives: 2,4,6-TNT-76.4 ppm
<b>Monitoring Well Installation and Ground Water Sampling</b> - 3 monitoring wells: (MW-13 through MW-15)	- VOCs - ND - Metals detected below MCLs-potential contamination - TRPH - ND Explosives (HMX 1.43 ppb, RDX 2.09 ppb, 1,3,5-TNB 3.93 ppb)

DAMES & MOORE - AREA 4		
ACTIVITY	PARAMETER	REASON
UXO Survey	Subsurface Ordnance	A UXO search will be conducted to clear the area prior to any invasive activities. If anomalies are detected, no drilling will performed in the suspect area.
Soil Boring/Sampling - grid (100-foot interval) Area southwest of Clover Place Approximately 6 borings Sampling depths: 0-12", 2-3', 4-5' 11 boreholes in fenced area at same depths (six along the fence, five in areas of apparent contamination)	VOCs, Metals, Explosives	VOCs, metals, and explosives were detected in the soil samples collected by OBG. This activity will help determine the horizontal and vertical extent of the contamination
Monitoring Well Installation/ Ground Water Sampling - 1 new shallow downgradient well - 1 new well cluster - 3 existing wells: (MW-17 through MW-19)	VOCs, Semivolatiles, Metals, Explosives, Pesticides	Metals and explosives were detected in ground water samples collected by OBG. This activity will help determine the extent of ground water contamination associated with Area 4.



**DAMES & MOORE - AREA 4**

ACTIVITY	PARAMETER	REASON
<p>Surface Water and Sediment Sampling</p> <ul style="list-style-type: none"><li>- 1 each near railroad tracks and fenced area</li><li>- 1 each in marshy area south-southwest of fenced area</li></ul>	<p>VOCs, Semivolatiles, Metals, Explosives, Pesticides</p>	<p>A sheen was observed on the surface of standing water near the fenced area; this activity will help assess the surface water quality at this location. Access is limited in the area south-southeast of Area 4; sampling of the marshy area will provide an indication of contaminant migration caused by surface water runoff from Area 4.</p>

OBG - AREA 5	
INVESTIGATION	RESULTS
<b>UXO Survey &amp; Removal</b> 3 surveys - initial - geophysical survey lines - MW installation areas	A mustard or acid gas emission unit was removed 3 large objects identified
<b>Geophysical Survey</b> - Magnetometer - GPR	Evidence of subsurface anomalies
<b>Soil Sampling</b> Surficial samples collected during drilling of MW-20	Field screening only, possible detection of cyanide No deep soil samples
<b>Monitoring Well Installation and Ground Water Sampling</b> 3 Monitoring Wells: (MW-20 through MW-22)	- VOCs - ND - Metals detected below MCLs - TRPH - ND - Explosives - analysis not performed

OBG - AREA 6	
INVESTIGATION	RESULTS
UXO Search	None found
3 Surficial Soil Samples (SS6-1, SS6-2, SS6-3)	VOCs - ND Metals - below NJ Action Levels Explosives - ND
3 Soil Borings (B-28, B-29, B-30) Samples from 3 depth intervals: 0-5 feet, 5-10 feet and 10-15 feet	VOCs - ND Metals - below NJ Action Levels Explosives - ND (analyzed in 0-5 feet composite only)
Ground Water 3 shallow wells: (MW-25, MW-26, MW-27) 2 deep wells: (MW-16, MW-34)	VOCs - ND Total Metals below MCLs Explosives - 1.54 ppb Tetryl (MW-16) TRPH - ND

<b>DAMES &amp; MOORE - AREA 6</b>		
<b>ACTIVITY</b>	<b>PARAMETERS</b>	<b>REASON</b>
UXO Survey	Subsurface Ordnance	A UXO search will be conducted to clear the area prior to any invasive activities. If anomalies are detected, no drilling will be performed in the suspect area.
Soil Borings/Sampling - Area 6A 20 borings in areas with visual contamination Sampling depth: 0-12", 2-3', 4-5'	VOCs (approximately 16 samples) Semivolatiles (6) Metals (40) Explosives (40)	Explosives were detected in a deep ground water sample; obvious signs of contamination were present around the acid plant. This activity will help determine the horizontal and vertical extent of the contamination.
Area 6B 3 borings Sampling depths: 0-12", 2-3', 4-5'	Metals Explosives	Obvious signs of contamination are present.
Area 6B-north 7 borings Sampling depths: 0-12", 2-3', 4-5'	VOCs Semivolatiles Metals Explosives	Obvious signs of contamination are present. Possible past use of the area as a landfill.
Monitoring Well Installation and Ground Water Sampling - Area 6A 1 new upgradient deep well 4 existing wells (3 shallow, 1 deep) 1 shallow downgradient well	Metals, Cyanide, VOCs, Semivolatiles, Explosives, Dithiane, Oxathiane, and Thiodiglycol Pesticides	Explosives were detected in a deep ground water sample collected by OBG. This activity will help determine if explosives, or other contamination, is present in area and/or upgradient ground water samples.

DAMES & MOORE - AREA 6		
ACTIVITY	PARAMETERS	REASON
<p>Surface Water and Sediment Sampling - Area 6A A minimum of three sediment and surface water:</p> <ul style="list-style-type: none"> <li>* north side of plant</li> <li>* west side of plant</li> <li>* south side of plant</li> </ul> <p>- Area 6B none</p>	<p>VOCs, Semivolatiles, Metals, Explosives, Pesticides</p>	<p>Signs of contamination have been observed on the surface of standing water around the LaPlace acid plant. This activity is to assess the general quality of the surface water and sediments surrounding the plant.</p>

OBG - AREA 7	
INVESTIGATION	RESULTS
UXO Search - spot and visual checks	None found
Geophysical Survey Magnetometer/GPR - altered grid	Evidence of TNT pit
3 Soil Borings to a depth of 6 feet Samples collected from: 0-5 feet, 5-10 feet, and 10-15 feet	- VOCs detected below action levels - potential contamination - Metals detected below action levels - potential contamination
3 Monitoring wells installed and ground water samples collected: MW-10, MW-11, and MW-12	- VOCs - ND - Metals detected below MCLs in effect at that time - TRPH - ND - Explosives - ND

<b>DAMES &amp; MOORE AREA 7</b>		
<b>ACTIVITY</b>	<b>PARAMETERS</b>	<b>REASON</b>
UXO Survey	Subsurface Ordnance	A UXO survey will be conducted to clear the area prior to any invasive activities. If anomalies are detected, no drilling will be performed in the suspect area.
Soil Borings/Sampling adjacent to and in sump area; 4 samples to a depth of 10 feet (4 borings)	VOCs Metals Explosives	Metals and VOCs were detected in OBG samples. This activity will help determine the extent of contamination.
Soil Gas Survey - Grid (150-foot interval) Approximately 20 points	VOCs	To assess the extent of VOC contamination.
2 Borings Sampling depths: 0-12", 2-3', 4-5'	VOCs Metals Explosives	Based on soil gas survey.
Ground Water Sampling 3 existing wells	VOCs Semivolatiles Metals Explosives Pesticides	To help assess the quality of the ground water beneath Area 7

DAMES & MOORE - AREA 8		
ACTIVITY	PARAMETERS	REASON
UXO Survey	Subsurface Ordnance	A UXO search will be conducted to clear the area prior to any invasive activities. If anomalies are detected, no drilling will be performed in the suspect area.
Monitoring Well Installation and Ground Water Sampling Possible installation of a shallow well south of potential landfill area, depending on the results of a soil gas survey	VOCs Semivolatiles Metals Explosives Pesticides	No ground water sampling was conducted by OBG. This activity is to help assess the potential ground water contamination associated with Area 8 and the landfill area.
Surface Water and Sediment Sampling - 1 in marshy area south-southwest of Area 8	Metals Explosives Semivolatiles Pesticides VOCs	This activity will give an indication of water quality from Area 8 since it appears that runoff from the soil mound flows in the direction of this area of surface water.



**OBG - AREA 9**

<b>INVESTIGATION</b>	<b>RESULTS</b>
2 Ordnance Searches	1987 - LEAD mine detector sweep on Part II. Sweep indicated possibility of buried ammunition below the detection capability of the mine detector. Located scrap metal and live shells that were removed. 1988 - OBG contamination evaluation: UXB International performed a visual inspection and made spot checks with an ordnance indicator - none detected.
3 Ground Water Monitoring Wells MW-4, MW-5, MW-6	VOCs detected (MW-4) 1,1-dichloroethylene - 26 ppb 1,1-dichlorethane - 220 ppb Trichloroethylene - 280 ppb Benzene - 16 ppb Metals detected below MCLs in effect at that time. TRPH - 5 ppm Explosives - none detected
3 Surficial Soil	VOCs - None detected Metals - below NJ Action Levels Explosives - none detected
3 Soil Borings Each boring drilled to 15.0' Samples obtained from 0-5', 5-10', 10-15'	VOCs - below NJ Action Levels Metals - below NJ Action Levels Explosives - not conducted

DAMES & MOORE - AREA 9		
ACTIVITY	PARAMETER	REASON
UXO Survey	Subsurface Ordnance	A UXO search will be conducted to clear the area prior to any invasive activities. If anomalies are detected, no drilling will be performed in the suspect area.
Ground Water Sampling Monitoring Well Installation and 1 Cluster monitoring well (shallow/deep) upgradient of Areas 9 and 10. 1 Cluster monitoring well near former MW-4. [Screened 5-15(shallow) and 15-25(deep)]	VOCs Semivolatiles Metals Explosives Pesticides	VOCs were detected in ground water samples near Area 9. This activity will assess the general quality of subsurface soils.
1 cluster monitoring well to be located downgradient of former MW-4, based on soil gas survey. Sample existing well MW-6	VOCs Semivolatiles Metals Explosives Pesticides	The downgradient wells will monitor the flow of contamination downgradient of MW-4
Soil gas survey - Up to 50 points	VOCs	To assess the extent of VOC contamination around MW-4

**DAMES & MOORE - AREA 10**

<b>ACTIVITY</b>	<b>PARAMETER</b>	<b>REASON</b>
UXO Survey	Subsurface Ordnance	A UXO search will be conducted to clear the area prior to any invasive activities. If anomalies are detected, no drilling will be performed in the suspect area.
Soil Borings: 20 boreholes based on a 100-foot grid; composite samples from depths of 0- to 2 feet	Metals Explosives	No soil analyses were performed by OBG. The study will provide information in areas thought to have the highest potential for contamination (Parts I and II)
Monitoring Well Installation Ground Water Sampling - Install one shallow well	VOCs Metals Explosives Semivolatiles Pesticides	The shallow monitoring well will provide data concerning ground water contamination downgradient of Area 10, Parts I and II.

OBG - AREA 11	
INVESTIGATION	RESULTS
2 UXO Searches Ordnance locators  Magnetometer and GPR	No. 1 No surface objects found. Spot checks with ordnance locator of the subsurface revealed numerous small objects within the fenced portion of the site.  No. 2 No surface objects found. Geophysical and GPR survey indicated the presence of 20 buried metal objects. Objects determined to be non-ordnance-related.
3 Surficial Soil	VOCs - Below NJ Action Levels Metals - Below NJ Action Levels Explosives - ND
Soil Borings	N/A
Ground Water 3 shallow monitoring wells: MW-28, MW-29, MW-30	VOCs - ND Total Metals - Below MCLs TRPH - ND Explosives - ND

<b>DAMES &amp; MOORE - AREA 11</b>		
<b>ACTIVITY</b>	<b>PARAMETER</b>	<b>REASON</b>
UXO	Subsurface Ordnance	A UXO search will be conducted to clear the area prior to any invasive activities. If anomalies are detected, no drilling will be performed in the suspect area.
Surface Water and Sediment Samples. 1 set of samples obtained at the confluence of the main creek, which trends northwest through Area 11, and the drainage ditch that services the ready mix plant.	VOCs Semivolatiles Metals Explosives (Sediment sample will also be analyzed for pesticide and PCBs)	A surface water sheen was noted in this area during the site reconnaissance. Sampling this confluence will monitor the downstream flow from the creek and the service ditch.
Soil Boring/Sampling - 10 boring locations across Area 11; composite sample 0-5 feet; boring depth 5 feet.	VOCs (a discrete sample, based on headspace analysis) Semivolatiles Metals Pesticides PCBs Explosives	No previous soil borings were placed in Area 11; surficial soil samples detected VOCs and metals. The area is reportedly backfilled with sediments from the Raritan River.
Surficial Soils 1 sample obtained northwest of standing water at building 737 (Figure 2).	VOCs Metals Explosives Semivolatiles Pesticides PCBs	Possible surficial soil contamination was noted during the site reconnaissance.
Ground Water Sampling - Existing shallow monitoring wells MW-28, MW-29, and MW-30	VOCs Metals Semivolatiles Explosives Pesticides	Previously, the existing wells contained metals below NJ action levels. The possibility of contamination in this area exists because of the potential presence of ordnance and contamination from dredged sediments.

DAMES & MOORE - AREA 12		
ACTIVITY	PARAMETER	REASON
UXO Search	Subsurface Ordnance (Explosives)	The area is suspected of containing ordnance and contaminated dredged spoils from the Raritan River Channel. A small portion (1/2 acre) has been, and is being, used for ordnance detonation. A UXO search will be conducted to clear the area prior to any invasive activities; if any anomalies are detected, no drilling will be performed in the suspect area.
Soil Borings (DOT Testing Area) - Grid at 50-foot centers - Sample 0-12", 2-3' and 4-5' Below the surface; 16 borings (to be performed after current detonation activities have been completed)	Metals Explosives	The area has been/is being used for explosives detonation.
Soil Borings (not in DOT Testing Area). - Area divided into 100 sections; 10 sections selected at random. Borings to 5 feet or ground water; composite soil samples from 0-5'	VOCs (discrete samples) Semivolatiles Metals Pesticides PCBs Explosives	The possibility of contamination exists because of the potential presence of contamination in the sediments dredged from the river.
Surficial Soils - Visual Inspection	Unknown	A visual inspection of surficial soil within Area 12 will be conducted during the drilling and sampling phase of the Former Raritan Arsenal. If any suspected areas of contamination are noted, the USACE will be notified prior to sampling.

**DAMES & MOORE - AREA 14**

<b>ACTIVITY</b>	<b>PARAMETER</b>	<b>REASON</b>
UXO Survey	Subsurface Ordnance	A UXO search will be conducted to clear the area prior to any invasive activities. If anomalies are detected, no drilling will be performed in the suspect area.
Soil Sampling - Divide Area 14 into approximately 100 sections. Through a random number generator, 10 sections will be selected and sampled.  - Composite soil samples from each selected section will be obtained from intervals of 0 to 5 feet or to the depth of ground water (whichever is encountered first)	Semivolatiles Metals Pesticides PCBs Explosives VOCs (discrete sample from each interval selected by headspace analyses)	Selected sections and associated soil boring locations will provide enough initial information to assess the possibility of contamination in the soils at Area 14. No previous studies have been performed in this area.
Monitoring Well Installation and Ground Water Sampling  - One downgradient shallow well (screened 5- to 15 feet from the surface)	VOCs Semivolatiles Metals Explosives Pesticides	The downgradient well will monitor the flow of potential contamination through Area 14 and provide data concerning the hydrology of the area. No other investigations have been done in this area.

**OBG - AREA 15**

<b>INVESTIGATION</b>	<b>RESULTS</b>
<p>3 UXO Searches</p> <ul style="list-style-type: none"><li>- January 1988 UXB</li><li>- August 1988 Consultant to current property owner</li><li>- November 1988 UXB</li></ul>	<p>A brief visual inspection revealed no apparent ordnance on the ground surface. Spot checks with an ordnance locator identified numerous small objects below the surface. No excavations were performed.</p> <p>Excavation of 53 test pits over most of the site. No indication of the presence of ordnance or other hazardous materials was reported.</p> <p>Prior to the OBG geophysical survey, a visual inspection revealed no surface contamination related to ordnance. Ordnance locators identified large and small objects below the ground surface. No hand excavations were performed.</p>
<p>Geophysical survey Magnetometer</p>	<p>EM survey identified a number of subsurface anomalies which may represent ferrous objects. Subsequent excavations for buildings revealed some objects that may have been the source of the magnetic anomalies.</p>
<p>Soil Borings</p> <ul style="list-style-type: none"><li>- 3 soil borings B-31, B-32, and B-33</li><li>- Collected samples from each boring at intervals (0-5, 5-10, 10-15) below grade.</li></ul>	<p>VOCs - ND Metals: Lead 276 ppm Explosives - ND Strong odor in B-32 at 12 foot interval</p>
<p>Ground Water</p> <ul style="list-style-type: none"><li>- 3 monitoring wells MW-35, MW-36, and MW-37. Screened intervals 5-35 feet, 5-30 feet, and 14-34 feet, respectively</li></ul>	<p>VOCs - ND Total Metals - Below MCLs TRPH - ND Explosives - ND</p>
<p>Surficial Soils</p> <ul style="list-style-type: none"><li>- 5 surface soil locations</li></ul>	<p>VOCs - ND Metals - Below action levels Explosives - ND</p>



OBG - AREA 16	
INVESTIGATION	RESULTS
2 UXB Surveys - January 1988 UXB	The survey was performed during the initial site inspection. A visual inspection revealed no apparent ordnance on the ground surface. Spot checks with an ordnance locator revealed numerous unidentified small buried objects.
- June 1988 UXB	Visual inspection revealed numerous partially buried 35-mm projectiles identified as being live.

# **DAMES & MOORE - AREA 16**

ACTIVITY	PARAMETER	REASON
<p>UXO Search</p>	<p>Subsurface Ordnance</p>	<p>Potential of UXO in area adjacent to the magazine buildings. A UXO search will be conducted to clear the area prior to any invasive activities. If anomalies are detected, no drilling will be performed in the suspect area.</p>
<p>Soil Sampling - 3 borings around magazine Building 643. Composite sample from 0-5' or to ground</p> <p>Six borings will be based on an assessment by a Huntsville ordnance unit.</p>	<p>Metals Explosives</p>	<p>To assess contamination from DOD activities.</p>
<p>Monitoring Well Installation and Ground Water Sampling - 1 monitoring well upgradient of Area 16</p> <p>- 4 monitoring wells downgradient of Area 16 (3 shallow, 1 deep)</p>	<p>VOCs Semivolatiles Metals Pesticides Explosives</p>	<p>The monitoring well locations are designated to monitor contamination migration (if any) from potential upgradient sources and migration through Area 16 downgradient.</p> <p>One well at magazine building 652 also will monitor the potential for localized pesticide contamination.</p>
<p>Surficial Soils Visual reconnaissance at building 630 (former drum storage building)</p>	<p>Visual Observation</p>	<p>Building 630 was reported to contain drums of acid and petroleum products. A visual assessment of surficial contamination will be performed.</p>

<b>DAMES &amp; MOORE - AREA 17A (BURNING AREA)</b>		
<b>ACTIVITY</b>	<b>PARAMETER</b>	<b>REASON</b>
UXO Search	Subsurface Ordnance	A UXO search will be conducted to clear the area prior to any invasive activities. If anomalies are detected, no drilling will be performed in the suspect area.
Soil Gas Survey - Over burning area (drawing D-418); 40-foot grid interval	Volatile Organic Compounds	To assess the presence of organic vapors as an indication of subsurface contamination.
Soil Borings/Sampling - 6 borings to a depth of 5 feet at locations adjacent to soil gas survey boreholes with highest readings; composite samples from depth intervals of 0-5 feet.	3 VOCs (from discrete sample) 6 Semivolatiles 6 Metals 6 Pesticides 6 PCBs 3 Explosives	To chemically analyze potential contamination in soils.
Monitoring Well Installation and Ground Water Sampling - 1 monitoring well cluster downgradient of Area 17A	VOCs Semivolatiles Metals Pesticides Explosives	To detect ground water contamination from Area 17A.